



TEXAS
Health and Human Services

Texas Department of State
Health Services

2017 Texas Stroke System of Care Report

Acknowledgements

A number of people played key roles in coordinating meetings, facilitating planning, writing, reviewing, and editing this report.

From the Department of State Health Services:

Teresa Kus, MPH – Epidemiologist, Office of Surveillance, Evaluation, and Research

Nimisha Bhakta, MPH – Manager, Office of Surveillance, Evaluation, and Research

Heather Bullis, MPH - Program Coordinator, Heart Attack and Stroke Data Collection Initiative

Carleigh Baudoin, MPH – Manager, Chronic Disease Branch

David Auzenne, MPH – Director, Health Promotion & Chronic Disease Prevention Section

We are grateful to the members of the Texas Council on Cardiovascular Disease and Stroke and the members of the Texas Heart Attack and Stroke Data Collaborative who contributed their time and expertise. We are also thankful to the hospitals who participated in the data collection initiative.

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY.....	4
II. INTRODUCTION.....	6
III. BACKGROUND	6
IV. STROKE IN TEXAS.....	7
V. EVALUATING HOSPITAL CARE FOR STROKE IN TEXAS	9
<i>HOSPITAL PARTICIPATION</i>	<i>10</i>
<i>FINAL STROKE DIAGNOSIS</i>	<i>10</i>
<i>PATIENT DEMOGRAPHICS</i>	<i>12</i>
VI. HOSPITAL STROKE PERFORMANCE MEASURES	13
ARRIVAL METHOD	14
<i>Arrival Method per Year</i>	<i>15</i>
ADVANCE NOTIFICATION	16
<i>Advance Notification by EMS per Year.....</i>	<i>17</i>
NATIONAL INSTITUTES OF HEALTH STROKE SCALE (NIHSS) REPORTED	18
<i>NIHSS Reported per Year.....</i>	<i>19</i>
TIME TO INITIAL BRAIN IMAGING.....	20
<i>Door-to-CT Imaging ≤ 25 Minutes per Year</i>	<i>21</i>
TIME TO INTRAVENOUS THROMBOLYTIC THERAPY - 45 MINUTES AND 60 MINUTES.....	22
<i>IV t-PA ≤ 45 and ≤ 60 Minutes per Year</i>	<i>23</i>
IV RT-PA ARRIVE BY 2 HOUR, TREAT BY 3 HOUR.....	25
<i>Arrive by 2 Hour, Treat by 3 Hour per Year</i>	<i>25</i>
IV RT-PA ARRIVE BY 3.5 HOUR, TREAT BY 4.5 HOUR	26
<i>Arrive by 3.5 Hour, Treat by 4.5 Hour per Year.....</i>	<i>27</i>
DRIP AND SHIP THERAPY	28
<i>Drip and Ship Therapy per Year</i>	<i>28</i>
ENDOVASCULAR THERAPY.....	29
<i>Endovascular Therapy per Year.....</i>	<i>30</i>
THROMBOLYTIC COMPLICATIONS	31
<i>Thrombolytic Complications per Year</i>	<i>31</i>
INTENSIVE STATIN THERAPY	32
<i>Intensive Statin Therapy per Year</i>	<i>32</i>
ANTITHROMBOTIC PRESCRIBED AT DISCHARGE	34
<i>Antithrombotic Prescribed at Discharge per Year</i>	<i>34</i>
ANTI-HYPERTENSIVES PRESCRIBED AT DISCHARGE	35
<i>Types of Anti-hypertensives Prescribed at Discharge per Year.....</i>	<i>36</i>
REHABILITATION CONSIDERED	37
<i>Rehabilitation Considered per Year</i>	<i>37</i>
STROKE EDUCATION	38
<i>Stroke Education per Year.....</i>	<i>39</i>
MODIFIED RANKIN SCALE AT DISCHARGE	40

<i>Modified Rankin Scale (mRS) per Year</i>	<i>40</i>
DISCHARGE DISPOSITION	41
<i>Discharge Disposition per Year.....</i>	<i>43</i>
VII. COMORBIDITIES	44
<i>HYPERTENSION</i>	<i>45</i>
<i>ATRIAL FIBRILLATION</i>	<i>46</i>
<i>DIABETES MELLITUS</i>	<i>46</i>
<i>DOCUMENTATION OF LIPID PROFILE</i>	<i>47</i>
<i>LIPID MEASURES – TOTAL CHOLESTEROL, LDL, HDL, TRIGLYCERIDES</i>	<i>47</i>
<i>DYSLIPIDEMIA.....</i>	<i>48</i>
<i>SMOKING.....</i>	<i>49</i>
<i>OVERWEIGHT AND OBESITY.....</i>	<i>50</i>
VIII. APPENDIX	51
IX. REFERENCES	53

EXECUTIVE SUMMARY

In 2015, stroke was the third leading cause of death among Texans causing 44.6 deaths per 100,000 people.¹ Stroke mortality varied by race/ethnicity. Deaths due to stroke were more common among blacks (63.3 deaths per 100,000 people) compared to whites (43.7 deaths per 100,000 people) and Hispanics (36.4 deaths per 100,000). In 2015, the prevalence of stroke among Texans, 18 years of age and older was 3.0%.²

In 2014, about 20 hospitalizations occurred due to stroke for every 10,000 people (20.3, 95% CI: 20.1-20.4).³ The total charges for stroke hospitalizations in 2014 was over \$3.3 billion. Medicaid beneficiaries accounted for over \$182 million of the total charges.³

In order to advance stroke reduction efforts, it is important to analyze the system of care by collecting and analyzing data. During the 83rd Regular Texas Legislative Session, funds were appropriated to advance heart attack and stroke reduction efforts throughout Texas. To inform such efforts, the Texas Department of State Health Services (DSHS) launched a heart attack and stroke data collection initiative.

To evaluate the care of patients diagnosed with a stroke, DSHS assessed elements within the stroke system of care for timeliness and appropriateness. DSHS analyzed data collected from the hospitals that agreed to participate in this data collection initiative. The data is collected in the Get With The Guidelines®-Stroke database using the Quintiles PMT® system, and reflects hospital care from the first quarter of 2008 through the fourth quarter of 2016.

Substantial stroke system of care findings, 2008-2016:

- A total of **50 different hospitals** provided data on individual episodes of stroke from 2008-2016 (Pg. 10).
 - 46 hospitals were located in urban and 4 in rural counties.
- In total, **94,451** episodes of care have been reported. Out of these, **88,907** episodes of stroke care were considered eligible for analysis and included in the reported measures (Pg. 10).
- Overall, about one out of three stroke patients (35.7%) arrived at the hospital by private vehicle. For the most recent three years (2014-2016), the arrival methods of stroke patients have remained similar (Pg. 14).
 - Among rural hospitals, 45.9% cases arrived at the hospital by private vehicle vs. 35.1% among urban hospitals.
- Overall, Emergency Medical Services (EMS) gave advance notification to the receiving hospital in 58.8% of cases transported by EMS from home or scene (Pg. 16).

- Rural hospitals reported that advance notification occurred for 70.3% of the cases vs. 58.1% among urban hospitals.
- In 2016, advance notification was provided by EMS for over half (53.4%) of the EMS transported patients (Pg. 16).
- For the most recent three years (2014-2016), the National Institutes of Health Stroke Scale (NIHSS) was used in over 90% of ischemic and stroke NOS cases each year (Pg. 18).
 - For the last five years (2012-2016), the median NIHSS score has remained the same; NIHSS score of 4, Minor stroke.
- Overall, about two out of five patients (42.0%) received initial brain imaging within 15 minutes of hospital arrival. The median door-to-imaging time was 18 minutes (Pg. 20).
- The door-to-CT imaging ≤ 25 minutes varied by arrival method; 68.7% of patients that arrived by EMS vs. 54.7% that arrived by private vehicle (Pg. 20).
 - The median door-to-CT time was 16 minutes for patients arriving by EMS and 23 minutes for arrival by private vehicle.
- Overall, about one out of four patients (25.5%) received Tissue plasminogen activator (tPA) within 45 minutes of hospital arrival and over half (56.8%) received tPA within 60 minutes (Pg. 22).
- The door-to-tPA times and percent treated varied by method of arrival (Pg. 23).
 - 58.9% of patients that arrived by EMS vs. 50.9% of patients arriving by private transport had a door-to-tPA time ≤ 60 minutes.
 - The median door-to-tPA time was 58 minutes.
- In 2016, 4.6% of stroke patients treated with thrombolytic therapy experienced bleeding complications post intravenous tPA (IV tPA) (Pg. 31).
- Of the eligible ischemic and Transient Ischemic Attack (TIA) patients, a little over half (51.5%), were prescribed a qualifying high-intensity statin at hospital discharge (Pg. 32).
- For the last six years, 98.0% or more of the ischemic and TIA patients were prescribed an antithrombotic at discharge (Pg. 34).
- From 2008-2016, nearly all (97.8%) stroke patients were considered for rehabilitative services (Pg. 37).
- The percent of eligible stroke patients who received all stroke educational materials increased annually and ranged from a low of 49.9% in 2008 to a high of 97.7% in 2016 (Pg. 38).
- From 2011-2016, about one out of four ischemic, hemorrhagic, and stroke NOS patients had a Modified Rankin Scale score (mRS) documented at discharge (Pg. 40).

INTRODUCTION

A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is blocked by a clot or ruptures, leading to death of brain cells.⁴ The two most common types of stroke include ischemic stroke and hemorrhagic stroke. An ischemic stroke is caused when blood and oxygen to the brain is blocked by a clot in a blood vessel, and a hemorrhagic stroke is caused when a blood vessel ruptures, not allowing blood flow to the brain. An additional type of stroke, transient ischemic attack or TIA, is known as a “mini stroke” that is caused by a temporary clot in a blood vessel.⁴

BACKGROUND

In order to advance stroke reduction efforts, it is important to assess the system of care by collecting and analyzing data. During the 83rd Regular Texas Legislative Session, funds were appropriated to advance heart attack and stroke reduction efforts throughout Texas. To inform such efforts, the Texas Department of State Health Services (DSHS) launched a Heart Attack and Stroke Data Collection initiative. The data collection initiative focuses on pre-hospital and hospital data elements. This report includes de-identified, aggregate data for hospitals who have agreed to share Get With The Guidelines® (GWTG)-Stroke data with DSHS. All data is protected under Health Insurance Portability Accountability Act (HIPAA) guidelines. No hospital level data will be distributed, nor will any hospital name be identified in the report. This aggregate data is intended to inform stakeholders about opportunities for collaboration and system improvement.

The objective of the data collection is to gain an understanding of the stroke systems of care in Texas; evaluate pre-hospital and hospital care components, and treatment of stroke patients. The findings will be used to assess the practices regarding delivery of care across the state and identify areas of opportunity for quality improvement.

STROKE IN TEXAS

In 2015, the prevalence of stroke among Texans 18 years of age and older was 3.0% (95% CI: 2.5-3.5).² The unadjusted prevalence of stroke for each year (2011-2015) overall and by race-ethnicity is displayed in Table 1.

TABLE 1. ESTIMATED NUMBER AND UNADJUSTED PREVALENCE OF STROKE, ADULTS, 18 YEARS AND OLDER, BY RACE/ETHNICITY, 2011-2015.

Year	Number of Adults	% of Adults (95% CI)	Race/Ethnicity			
			% White only (95% CI)	% Black only (95% CI)	% Hispanic (95% CI)	% Other (95% CI)
2011	487,039	2.7 (2.3-3.0)	2.7 (2.2-3.1)	5.2 (3.2-7.2)	1.8 (1.1-2.4)	--
2012	513,211	2.7 (2.3-3.1)	3.2 (2.6-3.8)	4.2 (2.6-5.8)	1.5 (0.9-2.0)	--
2013	487,955	2.5 (2.1-2.9)	3.0 (2.5-3.6)	3.7 (2.1-5.3)	1.6 (1.0-2.2)	--
2014	587,304	3.0 (2.5-3.4)	3.1 (2.6-3.7)	5.8 (3.9-8.6)	1.9 (1.4-2.6)	--
2015	608,538	3.0 (2.5-3.5)	3.1 (2.6-3.5)	4.7 (2.6-6.9)	2.3 (1.5-3.2)	--

Abbreviations: CI, confidence interval.

-- indicates data is not reportable due to small sample size.

HOSPITALIZATION

According to the 2013 Texas Behavioral Risk Factor Surveillance System (BRFSS) survey, an estimated 86.9% of adults in Texas said they would call 911 if they thought someone was having a heart attack or stroke. The remaining 13.1% of adults said they would take other action, such as take the person to the hospital, tell the person to call their doctor, call a spouse or family member, or do something else.

Table 2 displays the annual (2010-2014) age-adjusted hospitalization rates (per 10,000 individuals) for stroke among Texans of all ages. In 2014, for every 10,000 people about 20 hospitalizations occurred due to stroke (20.3, 95% CI: 20.1-20.4).³ The annual age-adjusted hospitalization rate for stroke (per 10,000) has slightly declined from 2010 to 2014.

TABLE 2. AGE-ADJUSTED STROKE HOSPITALIZATION RATES PER 10,000 INDIVIDUALS, ALL AGES, BY RACE/ETHNICITY, TEXAS, 2010-2014.

Year	Number Hospitalized	Age-Adjusted Hospitalization Rate (95% CI)	Race/Ethnicity			
			White only (95% CI)	Black only (95% CI)	Hispanic only (95% CI)	Other (95% CI)
2010	47,588	21.7 (21.5-21.9)	20.6 (20.3-20.8)	28.9 (28.1-29.6)	19.0 (18.6-19.4)	38.4 (36.9-39.9)
2011	49,224	21.7 (21.5-21.9)	20.4 (20.2-20.7)	30.7 (29.9-31.4)	17.9 (17.6-18.3)	32.7 (31.5-33.8)
2012	49,738	21.1 (20.9-21.2)	18.8 (18.6-19.0)	26.4 (25.8-27.1)	16.8 (16.4-17.1)	56.3 (54.8-57.8)
2013	50,500	20.7 (20.5-20.9)	19.4 (19.2-19.6)	27.5 (26.9-28.2)	17.0 (16.6-17.3)	34.9 (33.8-36.1)
2014	50,933	20.3 (20.1-20.4)	19.1 (18.9-19.3)	27.4 (26.7-28.0)	17.3 (17.0-17.7)	32.9 (31.7-34.0)

Abbreviations: CI, confidence interval.

In 2014, the total charges for hospitalizations due to stroke was over \$3.3 billion (Table 3).³ Medicare beneficiaries accounted for a little over 60 percent of hospital discharges and more than \$1.8 billion in total charges. The total charges for the Medicaid beneficiaries was over \$182 million.

TABLE 3. STROKE HOSPITAL DISCHARGES AND TOTAL CHARGES BY PRIMARY PAYMENT SOURCE, TEXAS, 2014.

Payer Source	Hospital Discharges		Total Charges
Total	N = 50,933	%	\$3,322,893,867
Medicaid	1,975	3.9	\$182,449,573
Medicare	31,219	61.3	\$1,855,008,631
Private Insurance	11,922	23.4	\$840,902,548
Uninsured	4,943	9.7	\$382,443,063
Other	874	1.7	\$62,090,052

MORTALITY

In 2015, stroke was the third leading cause of death among Texans of all ages, 44.6 deaths per 100,000 people (95% CI: 43.8-45.5).¹ When stratified by race/ethnicity, the age-adjusted stroke death rate was significantly higher among blacks, (63.3 per 100,000, 95% CI: 60.0-66.6), than whites (43.7 per 100,000, 95% CI: 42.7-44.8) and Hispanics (36.4 per 100,000, 95% CI: 34.8-38.0).

From 2011-2015, the average age-adjusted stroke death rate was 42.8 deaths per 100,000 Texans of all ages. Among race-ethnicity groups, deaths due to stroke were more common among blacks, (60.8 per 100,000, 95% CI: 59.3-62.3), than whites

(42.4 per 100,000, 95% CI: 42.0-42.9) and Hispanics (36.6 per 100,000, 95% CI: 35.9-37.4) populations.

The map below displays the geographic distribution of the annual age-adjusted stroke death rate per 100,000 Texans from 2011 to 2015. The highest death rates appear to emerge across northeast and central Texas.

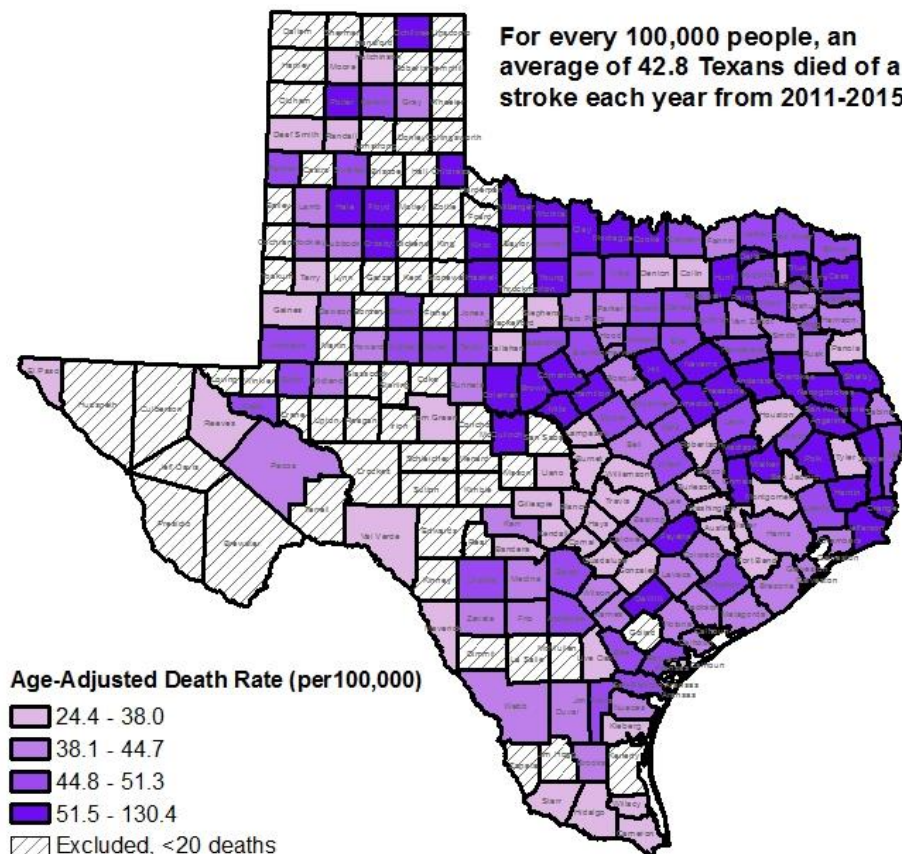


FIGURE 1. THE AGE-ADJUSTED STROKE DEATH RATE PER 100,000 PEOPLE, ALL AGES, BY COUNTY, TEXAS, 2011-2015.

EVALUATING HOSPITAL CARE FOR STROKE IN TEXAS

In an ideal system of care, all patients should receive proper care with minimal delays to treatment. To evaluate the care of patients diagnosed with a stroke, elements of care were assessed for timeliness and appropriateness.

DSHS analyzed data collected from a group of hospitals that agreed to participate in this data collection initiative. The data is collected in the GWTG®-Stroke database

using the Quintiles PMT® system, and reflects hospital care from the first quarter of 2008 through the fourth quarter of 2016.

HOSPITAL PARTICIPATION

A total of 94,451 cases of stroke were reported from 2008 through 2016. Overall 50 different hospitals participated from 2008 through 2016, after accounting for hospital participation and withdrawals. Of those 50 hospitals, 46 were located in urban counties and 4 in rural.

The number of patient beds among participating hospitals ranged from 43 to 1,502 beds per hospital. About half of the participating hospitals (26) had 100 to 299 beds capacity. Less than one in ten cases (7.4%) were treated at hospitals with less than 100 beds. About one in three cases (33.7%) were treated at hospitals with 500 or more beds.

Table 4. Number of Cases and Hospital Participation per Year, Patient Beds, and County Type, 2008-2016.

	Total Reported Cases	Number of Hospitals Participating
	N = 94,451 (%)	
Year	Hospitals per Year	
2008	4,523 (4.8)	20
2009	6,019 (6.4)	26
2010	8,024 (8.5)	32
2011	9,129 (9.7)	35
2012	10,433 (11.1)	40
2013	12,504 (13.2)	44
2014	14,048 (14.9)	48
2015	13,775 (14.6)	48
2016	15,996 (16.9)	48
Patient Beds	Hospitals by Patient Beds	
<100	6,990 (7.4)	8
100-299	32,287 (34.2)	26
300-499	23,341 (24.7)	10
≥500	31,833 (33.7)	6
County Type, 2016	Hospitals per County Type	
Urban	89,047 (94.3)	46
Rural	5,404 (5.7)	4

FINAL STROKE DIAGNOSIS

Table 5 and Figure 2 display the descriptive characteristics of each of the final stroke diagnoses from 2008 through 2016.

From 2008-2016, ischemic stroke accounted for 65.5% of all reported cases. Among the other stroke subtypes reported, 14.1% were transient ischemic attack (TIA),

10.5% intracerebral hemorrhage (ICH), 3.7% were subarachnoid hemorrhage (SAH), and 1.5% stroke not otherwise specified (NOS).

TABLE 5. DISTRIBUTION OF STROKE DIAGNOSIS BY DEMOGRAPHICS AND SELECTED CHARACTERISTICS, 2008-2016.

Final Stroke Diagnosis	Total Reported Cases		LOS (day)	Gender (Female)	Age (year)	Race (White)	Insurance (yes)	County (Rural)
	N=94,451	%	median	%	median	%	%	%
Ischemic Stroke	61,848	65.5	4	50.4	68	75.6	68.0	53.5
Transient Ischemic Attack (<24hrs)	13,288	14.1	2	56.8	69	80.8	75.1	24.7
Intracerebral Hemorrhage	9,897	10.5	6	46.3	66	72.8	62.6	8.0
Subarachnoid Hemorrhage	3,509	3.7	9	61.7	58	73.6	58.6	1.5
Stroke not otherwise specified	1,399	1.5	3	49.2	70	69.4	72.8	6.2
Elective Carotid Intervention only	2,903	3.1	2	47.7	71	88.6	69.7	3.8
No stroke related diagnosis	1,266	1.3	3	48.5	67	72.0	72.8	2.3
Missing	341	0.7	--	--	--	--	--	--

The median length of hospital stay (LOS) for stroke patients was 4 days. The LOS varied by final stroke diagnosis. Patients with a diagnosis of TIA had the shortest LOS (2 days). The hemorrhagic stroke diagnoses had the highest LOS; 6 days for an intracerebral and 9 days for subarachnoid stroke.

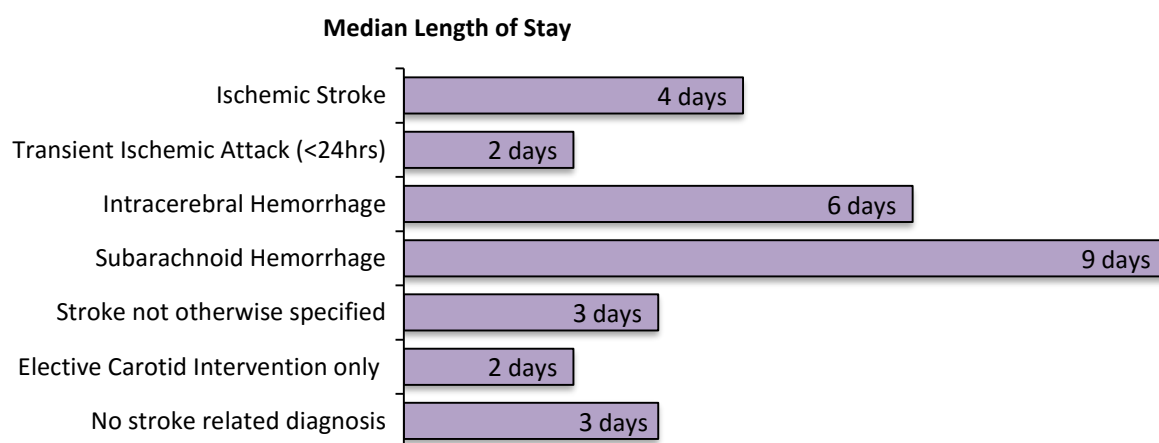


FIGURE 2. MEDIAN LENGTH OF STAY BY FINAL STROKE DIAGNOSIS.

PATIENT DEMOGRAPHICS

Table 6 displays the demographic characteristics of the 94,451 episodes reported from 2008 to 2016.

Women accounted for slightly over half, 50.9% (n=48,103), of the patient population. The median age of patients was 68 years, with patients aged 66 to 85 years accounting for 44.7% (n=42,240) of the total patients. About three out of four patients were white (76.1%, n=71,847) and non-Hispanic (75.7%, n=71,488). More than two thirds (68.0%, n=64,245) of patients had some form of health insurance. The median LOS among the demographic categories rarely deviated from the overall and was around 4 days.

TABLE 6. DEMOGRAPHIC CHARACTERISTICS AMONG REPORTED CASES, 2008-2016.

Demographics	Total reported cases N=94,451	%	LOS (days) median
Gender			
Female	48,103	50.9	4
Male	46,296	49.0	4
Unknown	52	0.1	4.5
Age (years)			
< 18	26	<0.1	6
18 – 45	7,066	7.5	4
46 – 65	34,287	36.3	4
66 – 85	42,240	44.7	4
> 85	10,832	11.5	4
Race			
White	71,847	76.1	4
Black or African American	14,919	15.8	4
Asian	1,191	1.3	4
American Indian/Alaskan			
Native	209	0.2	4
Native Hawaiian/Pacific			
Islander	89	0.1	5
Unable to determine (UTD)	6,006	6.4	0
Other	71	0.1	1
Missing	119	0.1	--
Ethnicity			
Hispanic	22,842	24.2	4
Non-Hispanic	71,488	75.7	4
Missing	121	0.1	--
Health Insurance Status			
Health insurance	64,245	68.0	4
Without health insurance	11,104	11.8	4
Missing	19,102	20.2	--

HOSPITAL STROKE PERFORMANCE MEASURES

The following tables and figures display the data for specific reporting, quality, and achievement measures for effective care of stroke patients. Annual percent trends for the period of 2008 – 2016 are also included for each of the measures of effective care for stroke patients. Additional information including data sources, inclusion and exclusion criteria can be found in the Appendix.

This report includes the following hospital performance measures for stroke:

1. Arrival Method
2. Advance Notification
3. National Institutes of Health Stroke Scale (NIHSS) Reported
4. Time to Initial Brain Imaging
5. Time to Intravenous Thrombolytic Therapy – 45 Minutes
6. Time to Intravenous Thrombolytic Therapy – 60 Minutes
7. IV rt-PA Arrive by 2 Hour, Treat by 3 Hour
8. IV rt-PA Arrive by 3.5 Hour, Treat by 4.5 Hour
9. Drip and Ship Therapy
10. Endovascular Therapy
11. Thrombolytic Complications
12. Intensive Statin Therapy
13. Antithrombotic Prescribed at Discharge
14. Anti-hypertensives Prescribed at Discharge
15. Rehabilitation Considered
16. Stroke Education
17. Modified Rankin Scale at Discharge
18. Discharge Disposition

ARRIVAL METHOD

Time to treatment can have a significant effect on stroke patient survival rate and potential disability. For that reason, it is important to evaluate the method of arrival for stroke patients. Transport protocols should be in place for Emergency Medical Services (EMS) transport to take suspected stroke patients to the hospital with the appropriate level of stroke care, whereas patients who arrive by private vehicle may be taken to a hospital that does not meet their medical and treatment needs.⁵

From 2008-2016, the most common mode of hospital arrival among stroke patients was EMS from home or scene (42.0%, n=37,330), followed by private transport/taxi/other from home or scene (35.7%, n=31,752), and transferred from other hospital (12.5%, n=11,127). Figure 3 displays the overall arrival method and among rural and urban hospitals separately.

Among the rural hospitals' stroke cases (n=5,008), almost half (45.9%, n=2,297) of the patients arrived at the hospital by private vehicle. While among urban hospitals 35.1% of the stroke cases arrived by private vehicle.

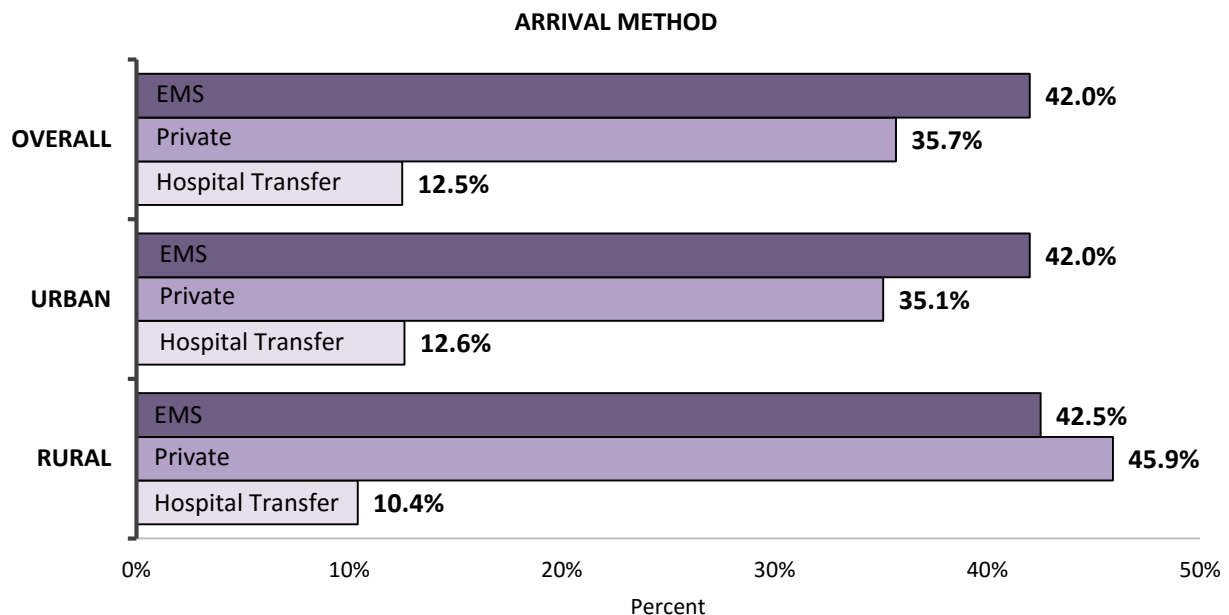


FIGURE 3. STROKE PATIENTS METHOD OF ARRIVAL OVERALL, AND URBAN/RURAL, 2008-2016.

Note: Missing and Unknown categories are not displayed in the chart so the total may not add up to 100% for each category.

Arrival Method per Year

Figure 4 and Table 7 display the annual percent and trend of arrival methods among stroke patients.

The annual percent trend for patients arrived by EMS ranged from a low of 30.1% in 2012 to a high of 55.9% in 2008. Arrival by private transportation ranged from 27.0% in 2012 to 42.2% in 2008. Percentage of patients transferred from another hospital increased substantially from 0.5% in 2008 to 16.2% in 2016.

- For the past three years (2014-2016), the pattern of arrival methods of stroke patients has remained similar.

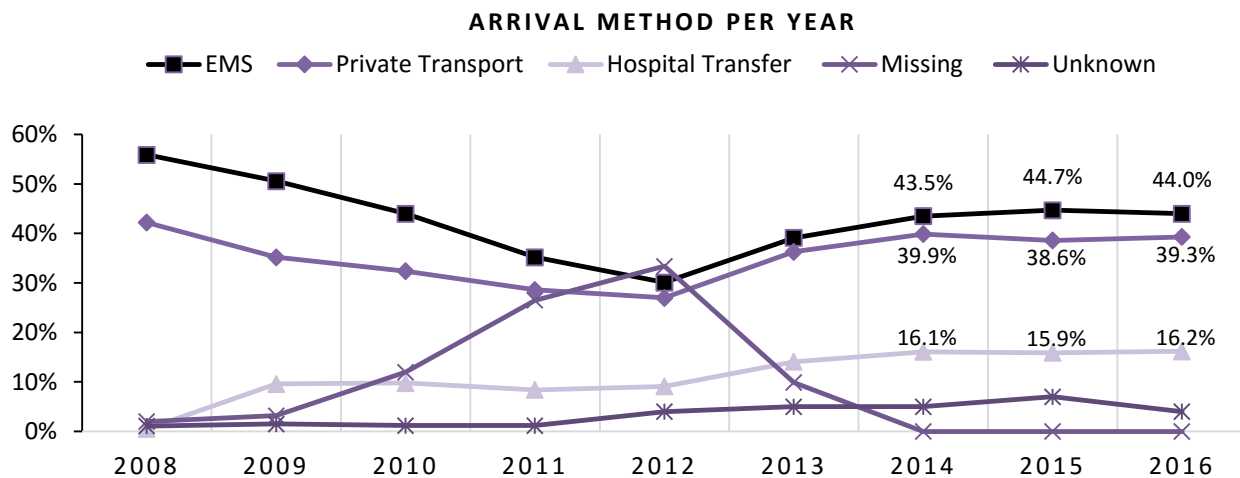


FIGURE 4. STROKE PATIENTS METHOD OF ARRIVAL BY YEAR.

TABLE 7. STROKE PATIENTS METHOD OF ARRIVAL BY YEAR.

Year	Stroke cases	EMS from home/scene	Private Transportation	Hospital Transfer	Missing	ND or Unknown	Reporting Hospitals
	N=88,907	n=37,330 (%)	n=31,752 (%)	n=11,127 (%)	n=8,052 (%)	n=646 (%)	No.
2008	4,500	2,517 (55.9)	1,899 (42.2)	23 (0.5)	11 (0.2)	50 (1.1)	20
2009	5,961	3,018 (50.6)	2,097 (35.2)	570 (9.6)	189 (3.2)	87 (1.5)	26
2010	7,820	3,438 (44.0)	2,536 (32.4)	765 (9.8)	986 (12.6)	95 (1.2)	32
2011	8,885	3,125 (35.2)	2,542 (28.6)	749 (8.4)	2,359 (26.5)	110 (1.2)	35
2012	10,065	3,034 (30.1)	2,714 (27.0)	915 (9.1)	3,367 (33.4)	35 (0.4)	40
2013	11,424	4,469 (39.1)	4,148 (36.3)	1,615 (14.1)	1,134 (9.9)	58 (0.5)	44
2014	12,770	5,550 (43.5)	5,091 (39.9)	2,063 (16.1)	1 (0.0)	65 (0.5)	48
2015	12,411	5,547 (44.7)	4,796 (38.6)	1,980 (15.9)	2 (0.0)	86 (0.7)	48
2016	15,071	6,632 (44.0)	5,929 (39.3)	2,447 (16.2)	3 (0.0)	60 (0.4)	48

Between 2008 and 2016, the number of hospitals reporting on arrival method increased each year, from 20 in 2008 to 48 in 2014-2016. An opportunity exists to explore why Texans continue to rely heavily on private transportation.

ADVANCE NOTIFICATION

A stroke alert protocol should be in place that requires EMS technicians to alert the receiving hospital of suspected stroke patients. EMS acts as the point of first contact, providing critical time information, such as symptom onset and time last known well (LKW), potentially improving arrival to treatment times.

From 2008-2016, 37,330 stroke patients transported by EMS from home or scene. Prior to hospital arrival, advance notification occurred in 53.5% of arrivals, 34.1% did not give notification, 3.4% were not applicable, and 9.1% cases data were missing (Figure 5).

Among rural hospitals' stroke cases (n=1,907), advance notification occurred for 70.3% (n=1,340) of the cases. Among urban hospitals' stroke cases (n=32,041), advance notification occurred for 58.1% (n=18,617) of the cases. This excludes missing data.

Advance notification varied by stroke diagnosis; the highest percent was seen among stroke NOS patients (67.2%, n=379) and the lowest percent was seen among hemorrhagic stroke patients (Intracerebral 56.0%, n=2,552 and Subarachnoid 52.2%, n=558).

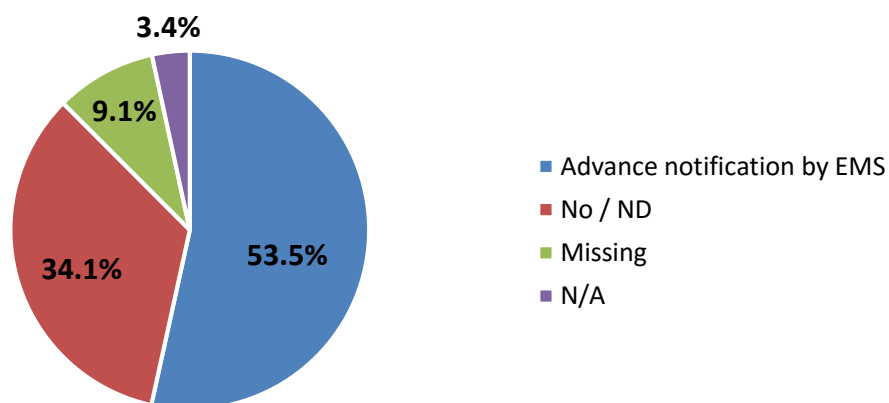


FIGURE 5. PERCENT OF ADVANCE NOTIFICATION BY EMS AMONG STROKE PATIENTS, 2008-2016.

Advance Notification by EMS per Year

Figure 6 and Table 8 display the percentage of advance notification provided prior to ED arrival among stroke cases that arrived by EMS from home/scene.

The yearly percent trend of advance notification varied, ranging from a low of 48.3% in 2015 to a high of 70.3% in 2011.

- In 2016, advance notification was provided by EMS for a little over half (53.4%, n=3,578) of the EMS transported patients.

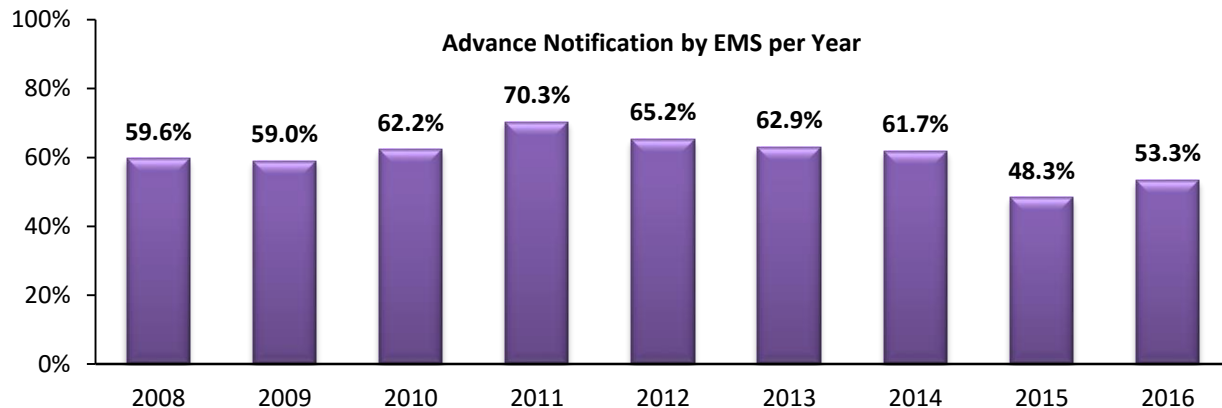


FIGURE 6. PERCENT OF ADVANCE NOTIFICATION BY EMS PER YEAR.

TABLE 8. PERCENT OF ADVANCE NOTIFICATION BY EMS PER YEAR.

Year	Eligible cases arriving via EMS N=33,948	Advance Notification n=19,957	Percent Advance Notification %	Reporting Hospitals No.
2008	2,314	1,379	59.6	18
2009	2,791	1,647	59.0	26
2010	3,144	1,954	62.2	31
2011	2,845	1,999	70.3	30
2012	2,656	1,733	65.2	34
2013	3,221	2,026	62.9	44
2014	5,110	3,151	61.7	48
2015	5,160	2,490	48.3	48
2016	6,707	3,578	53.3	48

Overall, the number of hospitals reporting on this measure increased, from 18 in 2008 to 48 participating hospitals in 2014-2016. The lack of advance notification by EMS prior to hospital arrival is a missed opportunity and indicates a gap in the stroke system of care regardless of geographic differences. Identifying the cause of under-utilization and potential barriers to use of pre-notification by EMS is needed. An opportunity exists to standardize the use of EMS stroke alert protocol across all hospital systems.

NATIONAL INSTITUTES OF HEALTH STROKE SCALE (NIHSS) REPORTED

When a potential stroke patient arrives at a hospital, an initial neurological examination should be conducted as a component of determining diagnosis of stroke and further care. The NIHSS is a standardized neurologic examination tool used to evaluate and document the patient's status. The NIHSS allows healthcare providers to easily quantify the degree of neurological deficits and severity, and identify the most appropriate treatment and level of care.⁵

From 2008-2016, the NIHSS was performed as part of the initial examination in 82.4% (n=48,183) of the eligible patients. Alternatively, 17.7% (n=10,329) of patients with a diagnosis of ischemic or stroke NOS did not have a NIHSS evaluation performed and/or initial score reported (Figure 7).

- From 2008-2016, about two out of five cases had a NIHSS score of 1-4 categorized as a minor stroke (39.3%, n=18,915), with an overall median NIHSS score of 4.

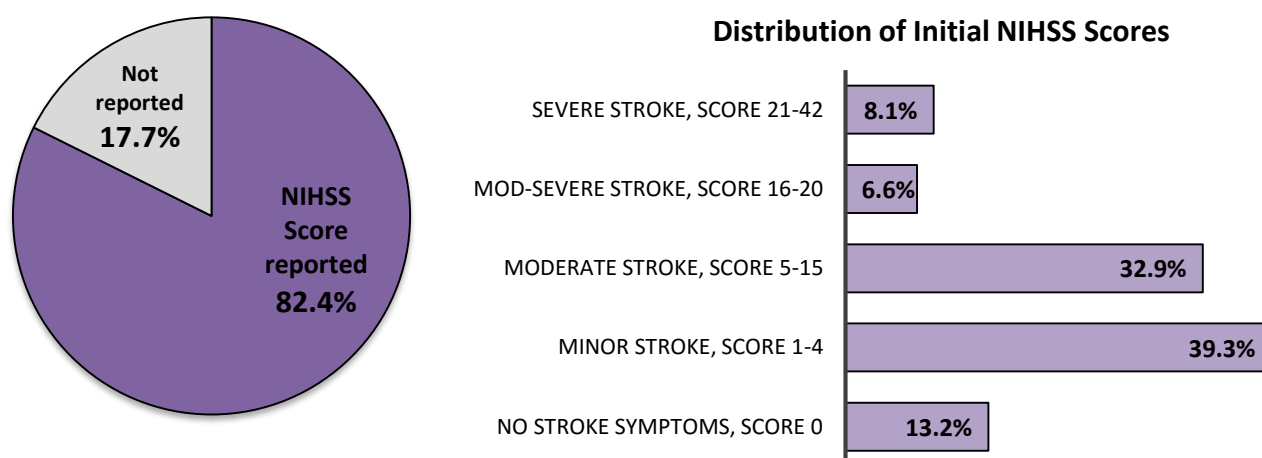


FIGURE 7. ISCHEMIC AND STROKE NOT OTHERWISE SPECIFIED PATIENTS WITH A NIHSS (INITIAL) SCORE, 2008-2016.

NIHSS Reported per Year

Figure 8 and Table 9 display the percent of ischemic and stroke NOS patients with a NIHSS score reported by year.

The percent of eligible patients with a diagnosis of ischemic or stroke NOS that received an NIHSS initial evaluation significantly increased from 2008 low of 43.8% to 93.9% in 2016.

- For the most recent three years (2014-2016), the NIHSS was reported in over 90% of ischemic and NOS cases each year.
- For the last five years (2012-2016), the median NIHSS score has remained the same (minor stroke, score 4).

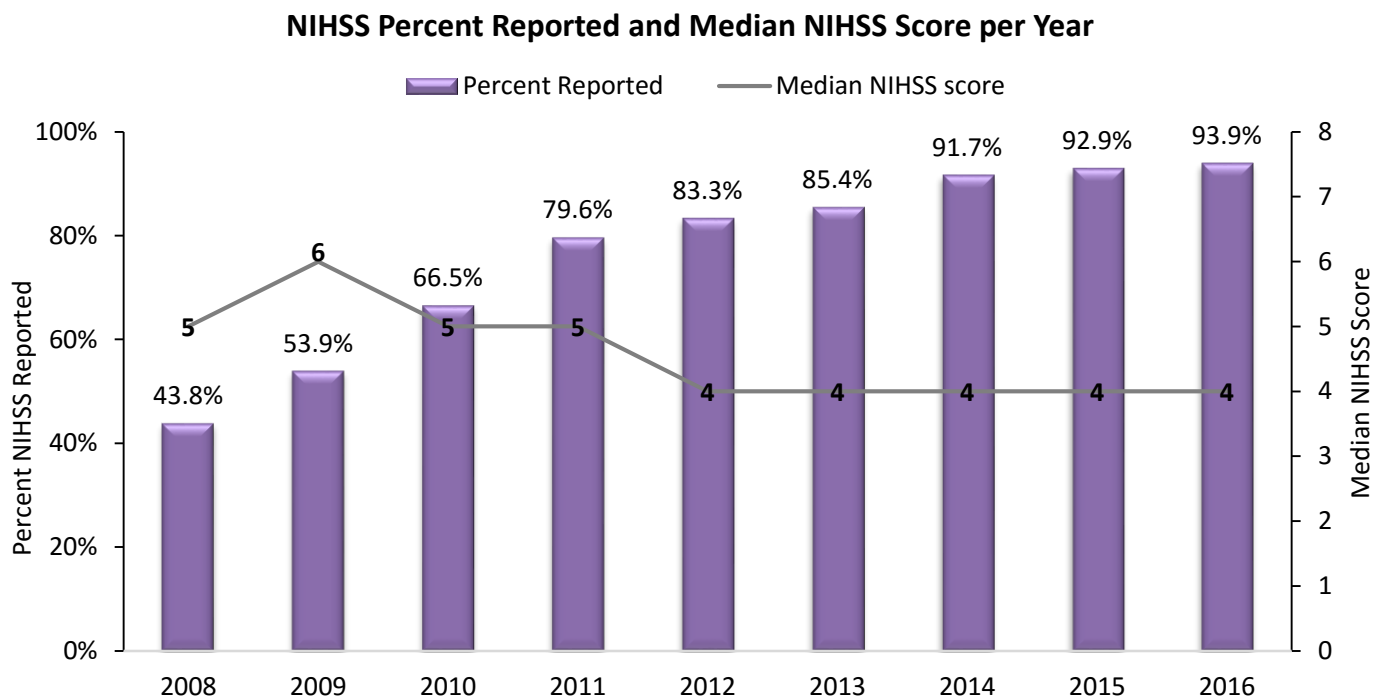


FIGURE 8. ISCHEMIC AND STROKE NOT OTHERWISE SPECIFIED PATIENTS WITH A NIHSS (INITIAL) SCORE BY YEAR.

TABLE 9. ISCHEMIC AND STROKE NOT OTHERWISE SPECIFIED PATIENTS WITH A NIHSS (INITIAL) SCORE BY YEAR.

Year	Ischemic & Stroke NOS cases	NIHSS score reported	Percent NIHSS score reported	Reporting Hospitals
	N=58,512	n=48,183	%	No.
2008	2,868	1,256	43.8	19
2009	3,600	1,941	53.9	26
2010	5,162	3,434	66.5	32
2011	5,992	4,769	79.6	35
2012	6,705	5,586	83.3	40
2013	7,428	6,346	85.4	42
2014	8,550	7,839	91.7	48
2015	8,188	7,609	92.9	48
2016	10,019	9,403	93.9	48

Between 2008 and 2016, the number of hospitals reporting on this measure increased annually, from 19 in 2008 to 48 participating hospitals in 2014-2016. Opportunities exist for improving the standardization of NIHSS use and score reporting across all hospital systems.

TIME TO INITIAL BRAIN IMAGING

Brain imaging or computerized tomography (CT) scan is used to identify the type and acuity of a stroke and to locate the blockage or clot.⁴ A timely initial CT scan is vital to providing effective treatment for a stroke patient. A CT scan should be performed within 25 minutes of hospital arrival and interpreted within 45 minutes of arrival.⁵

Among eligible patients who arrived to the hospital within 3 hours of time LKW (n=16,436), 63.3% (n=10,408) received the initial CT scan within 25 minutes of arrival (Figure 9). About two out of five patients (42.0%, n=6,899) had the initial brain imaging performed within 15 minutes of hospital arrival. Overall, the median door-to-initial imaging time was 18 minutes.

Door-to-CT imaging performed within 25 minutes varied by arrival method; 68.7% of patients that arrived by EMS vs. 54.7% that arrived by private vehicle. The median door-to-imaging time was 16 minutes for patients arriving by EMS and 23 minutes for those arriving by private vehicle (Figure 10).

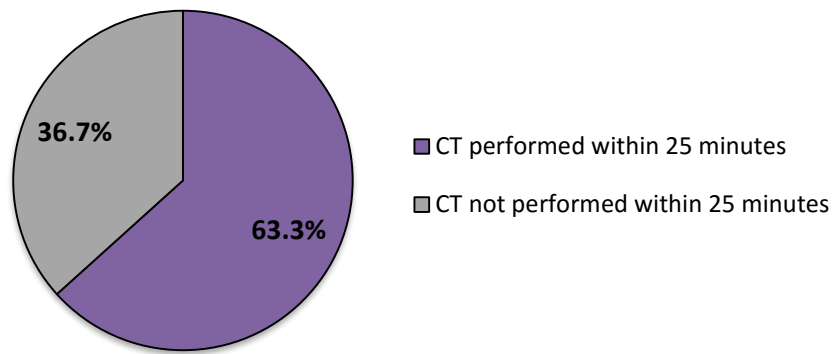


FIGURE 9. PERCENT OF STROKE PATIENTS THAT ARRIVED WITHIN 3 HOURS OF LKW AND HAD A DOOR-TO-CT TIME WITHIN 25 MINUTES OF ARRIVAL, 2008-2016.

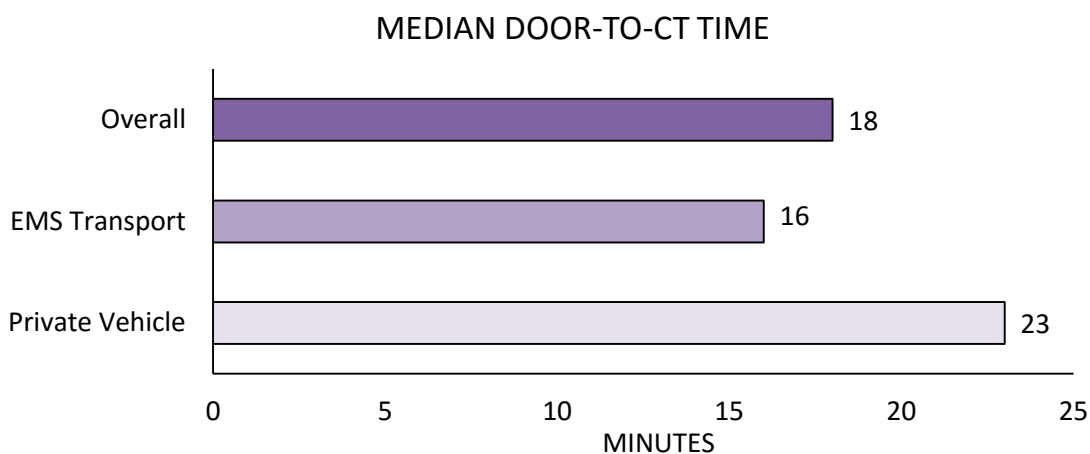


FIGURE 10. MEDIAN DOOR-TO-CT TIMES OF STROKE PATIENTS THAT ARRIVE WITHIN 3 HOURS, OVERALL AND ARRIVAL METHOD, 2008-2016.

Door-to-CT Imaging ≤ 25 Minutes per Year

Figure 11 and Table 10 display the percent of stroke patients who arrived within 3 hours of time LKW and initial CT scan performed within 25 minutes of hospital arrival by year.

The percent of eligible patients who arrived to the hospital within 3 hours of time LKW, and had an initial CT scan performed within 25 minutes of arrival ranged from a low of 39.3% in 2008 to a high of 74.7% in 2016.

- In 2016, about three out of four patients (74.7%), received initial CT imaging within 25 minutes. The median door-to-CT time was 14 minutes.

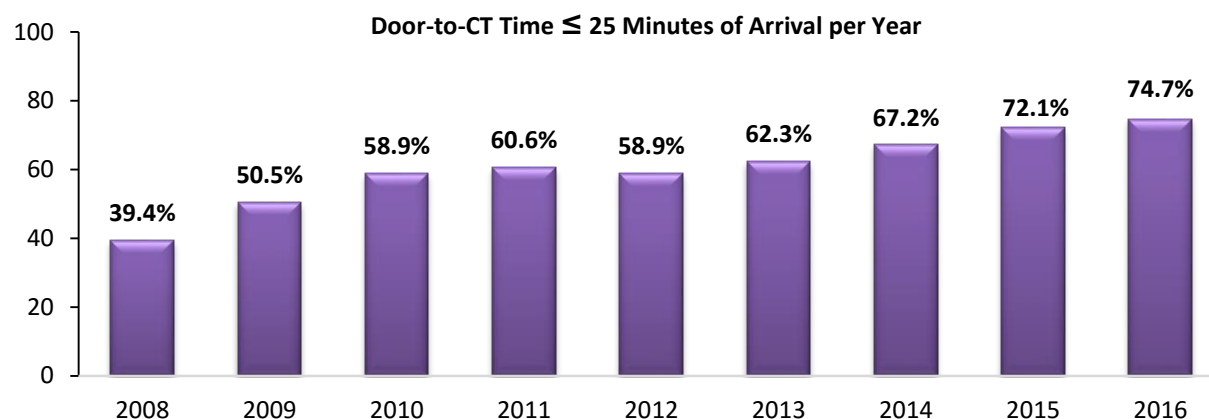


FIGURE 11. STROKE PATIENTS THAT ARRIVE WITHIN 3 HOURS WITH INITIAL CT SCAN WITHIN 25 MINUTES BY YEAR.

TABLE 10. STROKE PATIENTS THAT ARRIVE WITHIN 3 HOURS WITH INITIAL CT SCAN WITHIN 25 MINUTES BY YEAR.

Year	Stroke cases	CT scan within 25 minutes	Percent with CT within 25 minutes	Reporting Hospitals
	N=16,436	n=10,408	%	No.
2008	853	336	39.4	16
2009	1,201	606	50.5	24
2010	1,622	955	58.9	32
2011	1,775	1,076	60.6	34
2012	1,918	1,130	58.9	39
2013	2,044	1,273	62.3	43
2014	2,095	1,407	67.2	47
2015	2,166	1,562	72.1	48
2016	2,762	2,063	74.7	48

Between 2008 and 2016, the number of hospitals reporting on this measure increased annually, from 16 in 2008 to 48 participating hospitals in 2015 and 2016. While there has been improvement in door to CT time, opportunities exist for hospitals to reduce the time from emergency department (ED) arrival to initial brain imaging to promote timely and effective stroke treatment.

TIME TO INTRAVENOUS THROMBOLYTIC THERAPY - 45 MINUTES and 60 MINUTES

Thrombolytic therapy using IV t-PA is the preferred reperfusion strategy for eligible patients with acute ischemic stroke caused by a clot blocking a blood vessel.⁶ Time to IV t-PA therapy, often referred to as door-to-needle time, is a significant measure of hospitals quality that encompasses multiple elements of the stroke system of care; time of symptom onset, first medical contact, hospital arrival, initial CT scan, and

interpretation of CT scan. IV t-PA therapy should be administered within 60 minutes of hospital arrival for eligible acute ischemic stroke patients.⁵

Among acute ischemic stroke patients treated with IV t-PA from 2008-2016, about one in four, 25.5% (n=1,347) received IV t-PA within 45 minutes of arrival, and 56.8% (n=2,999) within 60 minutes of hospital arrival. The median door-to-tPA time was 58 minutes.

58.9% (n=2,192) of patients that arrived by EMS vs. 50.9% (n=502) that arrived by private vehicle had a door-to-tPA time within 60 minutes.

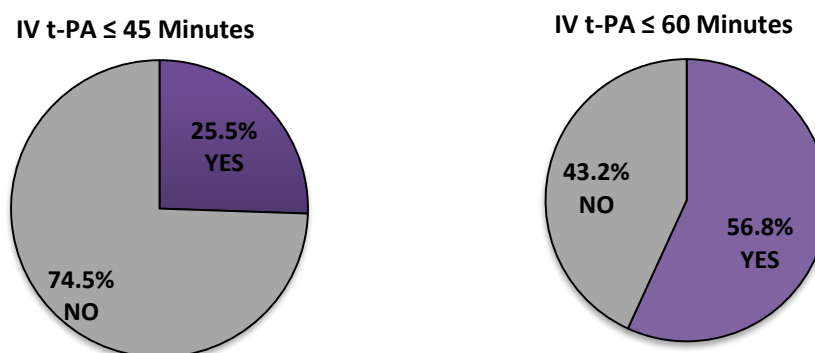


FIGURE 12. PERCENT OF ACUTE ISCHEMIC PATIENTS THAT RECEIVE IV TPA \leq 45 MINUTES AND \leq 60 MINUTES OF ARRIVAL, 2008-2016.

IV t-PA \leq 45 and \leq 60 Minutes per Year

Figure 13 and Table 11 display the percent of acute ischemic patients that received IV tPA within 45 minutes and 60 minutes of hospital arrival per year.

Among eligible patients, the percent treated with IV tPA within 45 minutes and within 60 minutes of hospital arrival increased annually. IV tPA within 45 minutes ranged from the low of 8.4% in 2008 to 40.6% in 2016. IV t-PA within 60 minutes of hospital arrival ranged from a low of 15.4% in 2008 to a high of 77.7% in 2016.

The median door-to-tPA times decreased from 94 minutes in 2008 to 50 minutes in 2016.

For the last four years (2013-2016), the median door-to-tPA time each year was less than 60 minutes; 57 minutes in 2013, 55 minutes in 2014, 51 minutes in 2015, and 50 minutes in 2016.

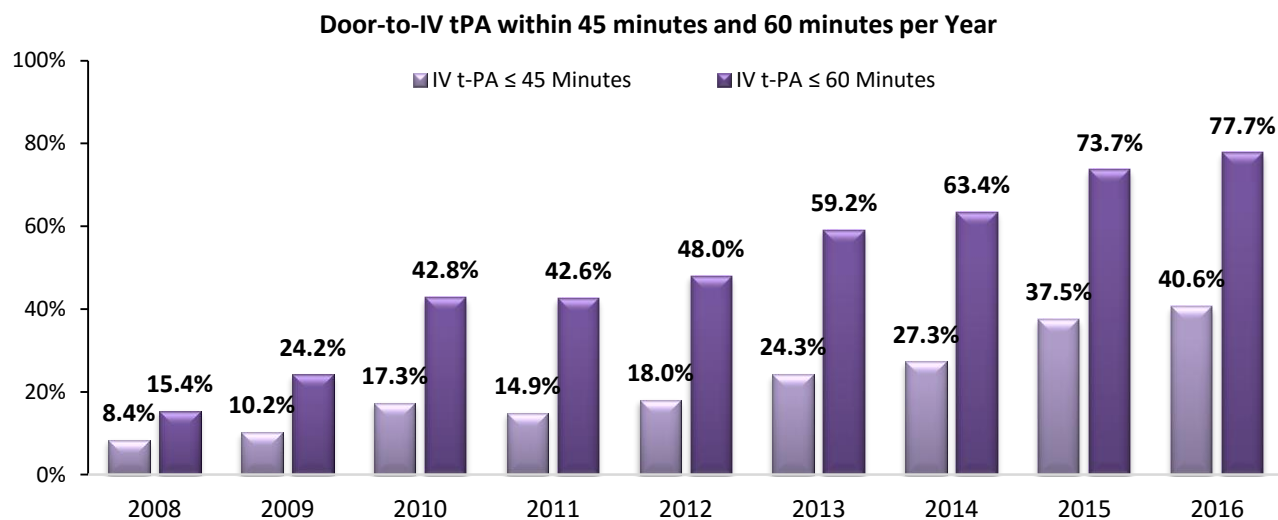


FIGURE 13. ACUTE ISCHEMIC STROKE PATIENTS TREATED WITH IV T-PA WITHIN 45 MINUTES, AND 60 MINUTES BY YEAR.

TABLE 11. ACUTE ISCHEMIC STROKE PATIENTS TREATED WITH IV T-PA WITHIN 45 MINUTES, AND 60 MINUTES BY YEAR.

Year	Acute ischemic stroke treated with IV tPA	Treated with IV tPA ≤45 mins	Percent Treated with IV tPA ≤45 mins	Treated with IV tPA ≤60 mins	Percent Treated with IV tPA ≤60 mins	Reporting Hospitals
	N=5,276	n=1,347	%	n=2,999	%	No.
2008	143	12	8.4	22	15.4	13
2009	294	30	10.2	71	24.2	20
2010	514	89	17.3	220	42.8	30
2011	665	99	14.9	283	42.6	33
2012	633	114	18.0	304	48.0	34
2013	639	155	24.3	378	59.2	40
2014	744	203	27.3	472	63.4	45
2015	710	266	37.5	523	73.7	45
2016	934	379	40.6	726	77.7	47

The number of hospitals reporting on this measure increased annually, from a low of 13 in 2008 to a high of 47 in 2016.

A gradual increase in the percentage of ischemic stroke patients receiving IV tPA within 60 minutes was observed in past few years. However, there is still need for standardization of protocols and implementation of best practices for the care of acute ischemic stroke patients across hospital systems.

IV rt-PA ARRIVE BY 2 HOUR, TREAT BY 3 HOUR

A critical component when evaluating a stroke patient is identifying the time last known well (LKW), or the time at which a patient was last known to be without signs and symptoms of a stroke. Acute ischemic stroke patients, who arrive at the hospital within 2 hours of time LKW, should be treated within 3 hours of time LKW.⁵

Among acute ischemic stroke patients whose time of arrival is within 2 hours of time LKW, 95.3% (n=4,548) received IV tPA within 3 hours, while 4.7% (n=224) did not receive IV tPA within the recommended 3 hours of LKW (Figure 14).

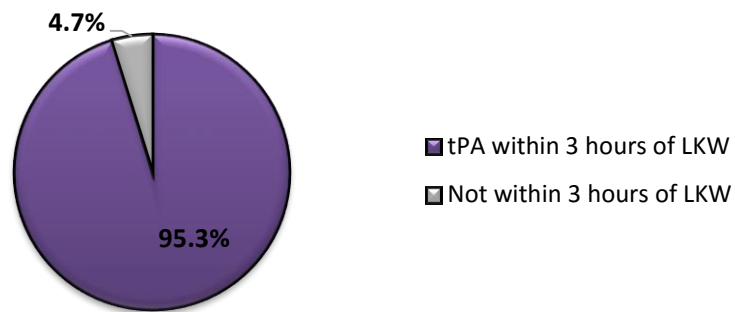


FIGURE 14. PERCENT OF ACUTE ISCHEMIC STROKE PATIENTS THAT ARE TREATED WITHIN 3 HOURS OF TIME LKW, 2008-2016.

Arrive by 2 Hour, Treat by 3 Hour per Year

Figure 15 and Table 12 represent the acute ischemic stroke patients who arrived at the hospital within 2 hours of time LKW and were treated with IV t-PA within 3 hours of time LKW by year.

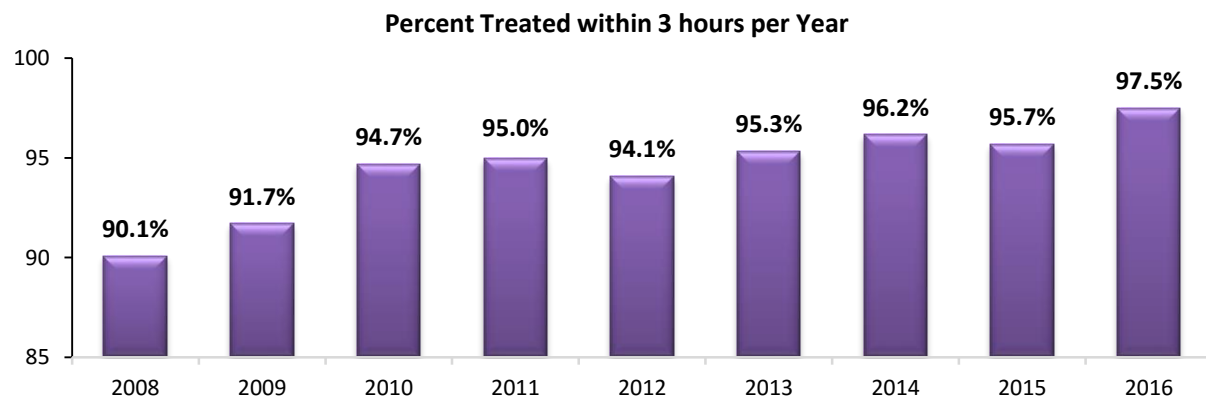


FIGURE 15. ACUTE ISCHEMIC STROKE PATIENTS THAT ARE TREATED WITHIN 3 HOURS OF TIME LKW BY YEAR.

TABLE 12. ACUTE ISCHEMIC STROKE PATIENTS THAT ARE TREATED WITHIN 3 HOURS OF TIME LKW BY YEAR.

Year	Acute ischemic IVt-PA-treated cases that arrive ≤2 hours n=4,772	Treated with IV t-PA ≤ 3 hours n=4,548	Percent treated with IV t-PA ≤ 3 hours %	Reporting Hospitals No.
2008	131	118	90.1	13
2009	253	232	91.7	21
2010	433	410	94.7	30
2011	518	492	95.0	33
2012	574	540	94.1	37
2013	620	591	95.3	42
2014	730	702	96.2	46
2015	673	644	95.7	45
2016	840	819	97.5	46

Between 2008 and 2016, the number of hospitals reporting for this measure increased, from 13 in 2008 to 46 in 2014 and 2016. The percent of eligible patients who arrived at the hospital within 2 hours of time LKW and were treated with IV t-PA within 3 hours of time LKW varied but overall remained high. The percent treated increased from 90.1% in 2008 to 97.5% in 2016.

IV rt-PA ARRIVE BY 3.5 HOUR, TREAT BY 4.5 HOUR

Acute ischemic stroke patients, who arrive at the hospital within 3.5 hours of time LKW and are eligible for IV t-PA therapy, should be treated with IV t-PA within 4.5 hours of time LKW.⁵

Among eligible acute ischemic stroke patients who arrived at the hospital within 3.5 hours of time LKW, 70.1% (n=6,120) received IV t-PA treatment within 4.5 hours, while 29.9% (n=2,611) did not receive IV t-PA treatment within 4.5 hours (Figure 16).

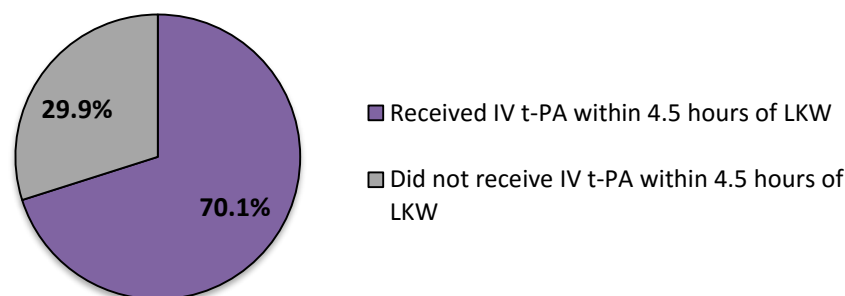


FIGURE 16. PERCENT OF ACUTE ISCHEMIC STROKE PATIENTS THAT ARE TREATED WITHIN 4.5 HOURS OF LKW, 2008-2016.

Arrive by 3.5 Hour, Treat by 4.5 Hour per Year

Figure 17 and Table 13 represent the acute ischemic stroke patients who arrived at the hospital within 3.5 hours of time LKW and treated with IV t-PA within 4.5 hours of time LKW by year.

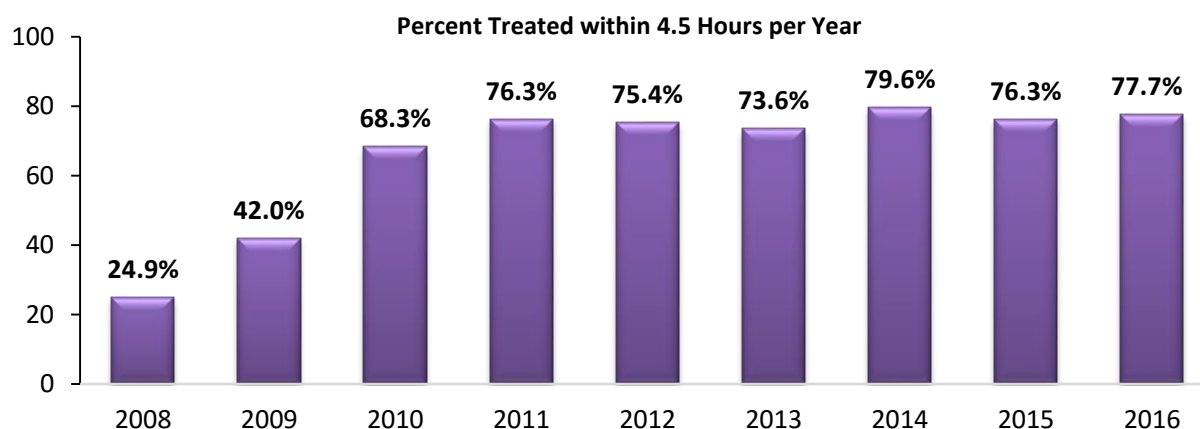


FIGURE 17. ACUTE ISCHEMIC STROKE PATIENTS THAT ARE TREATED WITHIN 4.5 HOURS OF LKW BY YEAR.

TABLE 13 ACUTE ISCHEMIC STROKE PATIENTS THAT ARE TREATED WITHIN 4.5 HOURS OF LKW BY YEAR.

Year	Acute ischemic tPA-treated cases that arrive ≤3.5 hours n=8,731	Treated with IV tPA ≤4.5 hours n=6,120	Percent treated with IV tPA ≤4.5 hours %	Reporting Hospitals No.
2008	519	129	24.9	13
2009	698	293	42.0	23
2010	723	494	68.3	31
2011	820	626	76.3	32
2012	898	677	75.4	39
2013	1,055	776	73.6	42
2014	1,159	923	79.6	47
2015	1,392	1,062	76.3	48
2016	1,467	1,140	77.7	48

Between 2008 and 2016, the number of participating hospitals reporting on this measure increased annually, from 13 in 2008 to 48 participating hospitals in 2016. The annual percent trend ranged from a low of 24.9% in 2008 to 79.6% in 2014. Compared to the previous measure, time to initiation of IV t-PA treatment of patients who arrive by 2 hours of time LKW (95.3%), a significant difference in time to initiation of treatment is seen for patients who arrive within 3.5 hours of time LKW (70.1%).

Improving in the process of care including decreased arrival to treatment times, can potentially increase the odds of favorable health outcomes among a patient population that is already at an increased risk of poor health outcomes.

DRIP AND SHIP THERAPY

Drip and ship denotes ischemic stroke patients for whom IV t-PA was initiated at the ED of a community hospital and then transferred to a comprehensive stroke center.

Among the eligible ischemic stroke patients (n=63,254), 2.0% (n=1,264) had initiation of IV t-PA therapy at a community hospital ED (Table 14).

TABLE 14. DRIP AND SHIP THERAPY AMONG ISCHEMIC STROKE PATIENTS, 2008-2016.

Ischemic stroke cases (N)	IV tPA initiated at a community hospital (n)	Percent community hospital %
63,254	1,264	2.0

Drip and Ship Therapy per Year

A slight, but continuous increase in the practice of drip and ship therapy is seen in past few years. The percent of eligible patients that receive IV t-PA in the ED of a community hospital prior to being transferred ranged from a low of 0.3% in 2008 to a high of 2.8% in 2016.

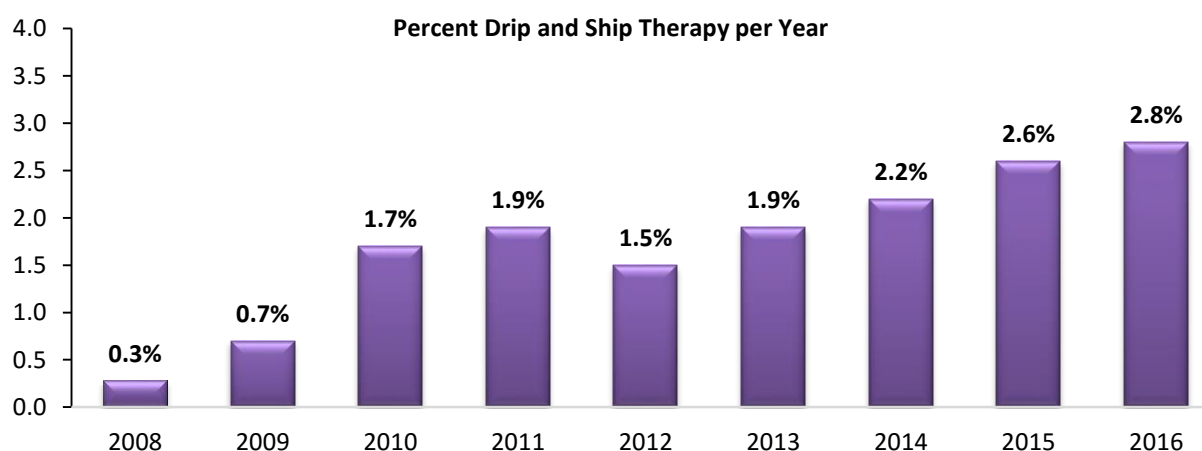


FIGURE 18. DRIP AND SHIP THERAPY AMONG ISCHEMIC STROKE PATIENTS BY YEAR.

TABLE 15. DRIP AND SHIP THERAPY AMONG ISCHEMIC STROKE PATIENTS BY YEAR.

Year	Ischemic Stroke cases	Drip and Ship cases	Percent Drip and Ship cases	Reporting Hospitals
	N=63,254	n=1,264	%	No.
2008	2,787	8	0.3	16
2009	3,691	26	0.7	25
2010	5,379	93	1.7	33
2011	6,175	116	1.9	34
2012	7,139	107	1.5	40
2013	7,976	153	1.9	42
2014	8,999	196	2.2	48
2015	10,453	269	2.6	48
2016	10,655	296	2.8	48

Between 2008 and 2016, the number of hospitals reporting on this measure increased annually, from 16 to 49 participating hospitals in 2016.

ENDOVASCULAR THERAPY

Endovascular therapy includes patients with a diagnosis of ischemic stroke that received Intra-arterial (IA) catheter-based treatment either in the ED, as an in-patient, or outside of the treating hospital.

Among the eligible ischemic stroke patients (n=63,254), 1.4% (n=891) received IA catheter-based reperfusion either at the ED, as an in-patient or outside of the treating hospital (Table 16).

TABLE 16. ISCHEMIC STROKE PATIENTS THAT RECEIVE ENDOVASCULAR THERAPY, 2008-2016.

Ischemic stroke cases (N)	IA catheter-based reperfusion* (n)	Percent IA catheter-based reperfusion* %
63,254	891	1.4

*either at the ED, as an in-patient, or outside of the hospital.

Endovascular Therapy per Year

The percent of ischemic stroke patients who received endovascular therapy ranged from a low of 0.4% in 2008 to a high of 2.5% in 2016.

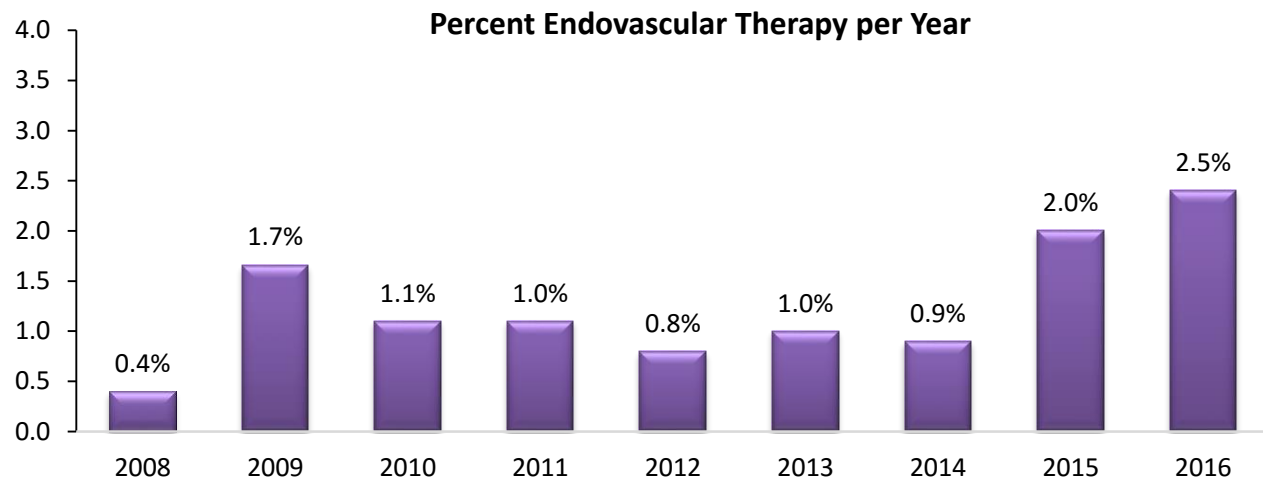


FIGURE 19. ENDOVASCULAR THERAPY AMONG ISCHEMIC STROKE PATIENTS BY YEAR.

TABLE 17. ENDOVASCULAR THERAPY AMONG ISCHEMIC STROKE PATIENTS BY YEAR.

Year	Ischemic stroke cases	IA catheter-based reperfusion	Percent IA catheter-based reperfusion	Reporting Hospitals
	N=63,254	n=891	%	No.
2008	2,787	12	0.4	16
2009	3,691	63	1.7	25
2010	5,379	61	1.1	33
2011	6,175	62	1.0	34
2012	7,139	56	0.8	40
2013	7,976	75	1.0	42
2014	8,999	85	0.9	48
2015	10,453	213	2.0	48
2016	10,655	264	2.5	48

Between 2008 and 2016, the number of hospitals reporting on this measure increased annually, from 16 in 2008 to 48 participating hospitals in 2016.

THROMBOLYTIC COMPLICATIONS

Thrombolytic complications describe patients with a diagnosis of acute ischemic stroke that experience bleeding complications after thrombolytic therapy was administered.

Of the 63,254 acute ischemic stroke patients, 11.5% (n=7,277) received IV t-PA or IA catheter-based treatment from the treating hospital. Among those patients, 4.6% (n=334) experienced bleeding complications after IV tPA or IA catheter-based treatment was administered (Figure 20).

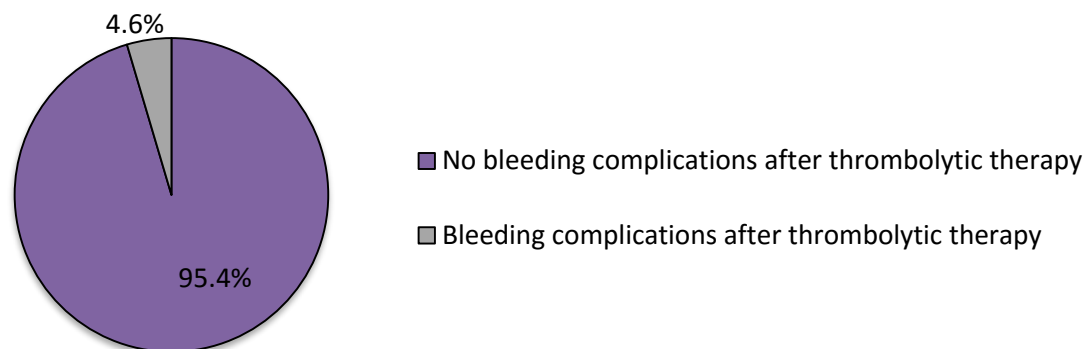


FIGURE 20. PERCENT OF ISCHEMIC STROKE PATIENTS WITH BLEEDING COMPLICATIONS AFTER THROMBOLYTIC THERAPY, 2008-2016.

Thrombolytic Complications per Year

The percent of eligible patients who experienced bleeding complications post thrombolytic therapy ranged from a low of 3.4% in 2010 to a high of 6.2% in 2011. Between 2008 and 2016, the overall number of participating hospitals reporting on this measure has increased from 11 in 2008 to 48 in 2016.

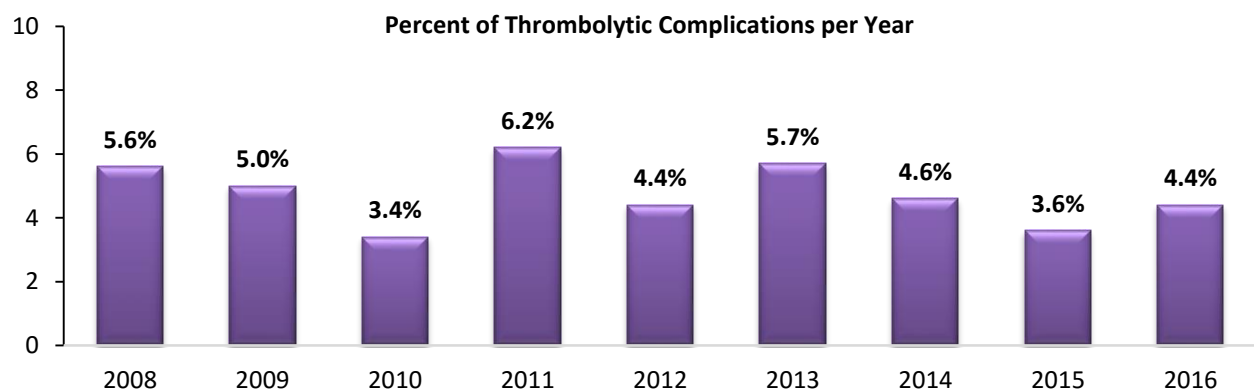


FIGURE 21. ISCHEMIC STROKE PATIENTS WITH BLEEDING COMPLICATIONS AFTER THROMBOLYTIC THERAPY BY YEAR.

TABLE 18. ISCHEMIC STROKE PATIENTS WITH BLEEDING COMPLICATIONS AFTER THROMBOLYTIC THERAPY BY YEAR.

Year	Thrombolytic therapy-treated cases n=7,277	Bleeding complications n=334	Percent bleeding complications %	Reporting Hospitals No.
2008	143	8	5.6	11
2009	337	17	5.0	21
2010	584	20	3.4	30
2011	705	44	6.2	32
2012	755	33	4.4	38
2013	909	52	5.7	42
2014	1,080	50	4.6	46
2015	1,319	47	3.6	45
2016	1,445	63	4.4	48

INTENSIVE STATIN THERAPY

Of the eligible ischemic and TIA patients, a little over half (51.5%, n=8,623), were prescribed a qualifying high-intensity statin at hospital discharge, while 48.5% (n=8,121) were discharged without (Figure 22).

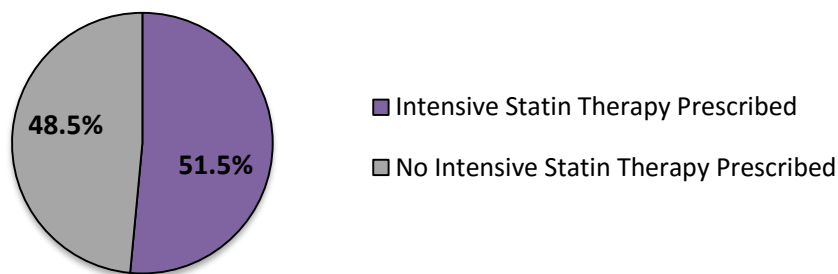


FIGURE 22. PERCENT OF ISCHEMIC AND TIA PATIENTS DISCHARGED WITH INTENSIVE STATIN THERAPY, 2008-2016.

Intensive Statin Therapy per Year

Figure 23 and Table 19 display the percent of eligible ischemic and TIA patients that were prescribed a qualifying high-intensity statin at hospital discharge by year.

The percent of eligible ischemic and TIA patients prescribed qualifying high-intensity statin therapy at discharge varied annually from a low of 30.9% in 2011 to a high of 71.9% in 2016.

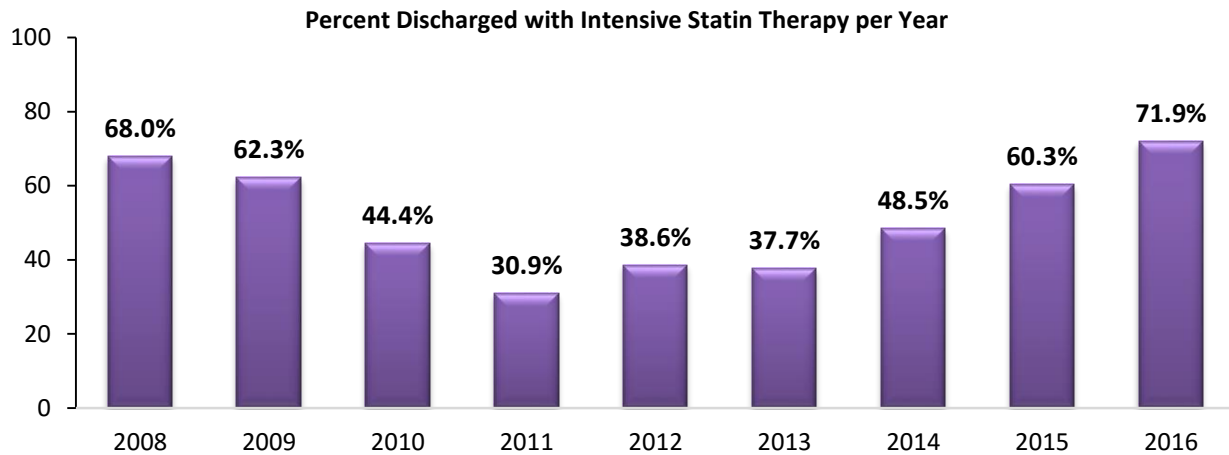


FIGURE 23. ISCHEMIC AND TIA PATIENTS DISCHARGED WITH INTENSIVE STATIN THERAPY BY YEAR.

TABLE 19. ISCHEMIC AND TIA PATIENTS DISCHARGED WITH INTENSIVE STATIN THERAPY BY YEAR.

Year	Eligible Ischemic & TIA stroke cases N=16,744	Intensive Statin Therapy n=8,623	Percent Intensive Statin Therapy %	Reporting Hospitals No.
2008	25	17	68.0	16
2009	705	439	62.3	24
2010	1,313	583	44.4	31
2011	1,622	501	30.9	35
2012	1,618	624	38.6	39
2013	2,353	886	37.7	42
2014	2,758	1,338	48.5	48
2015	2,854	1,721	60.3	47
2016	3,496	2,514	71.9	47

Between 2008 and 2016, the number of hospitals reporting on this measure increased annually, from 16 in 2008 to 48 participating hospitals in 2014. In 2015 and 2016, the number of hospitals reporting dropped to 47.

ANTITHROMBOTIC PRESCRIBED AT DISCHARGE

From 2008-2016, nearly all eligible ischemic stroke and TIA patients (98.0%, n=60,668) were prescribed antithrombotic therapy at discharge (Figure 24).

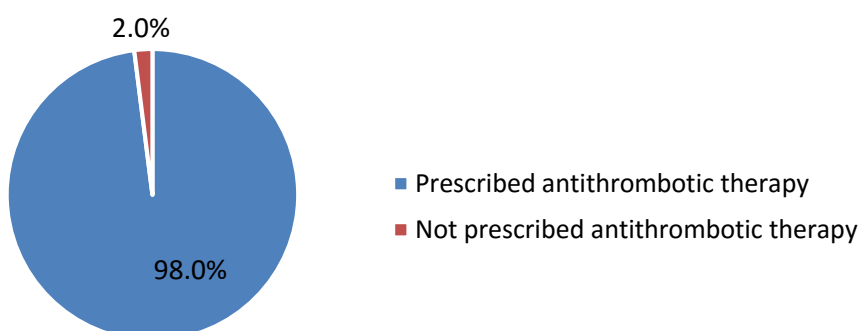


FIGURE 24. PERCENT OF ISCHEMIC AND TIA PATIENTS DISCHARGED WITH ANTITHROMBOTIC MEDICATION, 2008-2016.

Antithrombotic Prescribed at Discharge per Year

Figure 25 and Table 20 display the percent of eligible ischemic stroke and TIA patients that were prescribed antithrombotic medication at hospital discharge by year.

The percent of eligible ischemic and TIA patients discharged with antithrombotic therapy increased from 94.6% in 2008 to 99.0% in 2016.

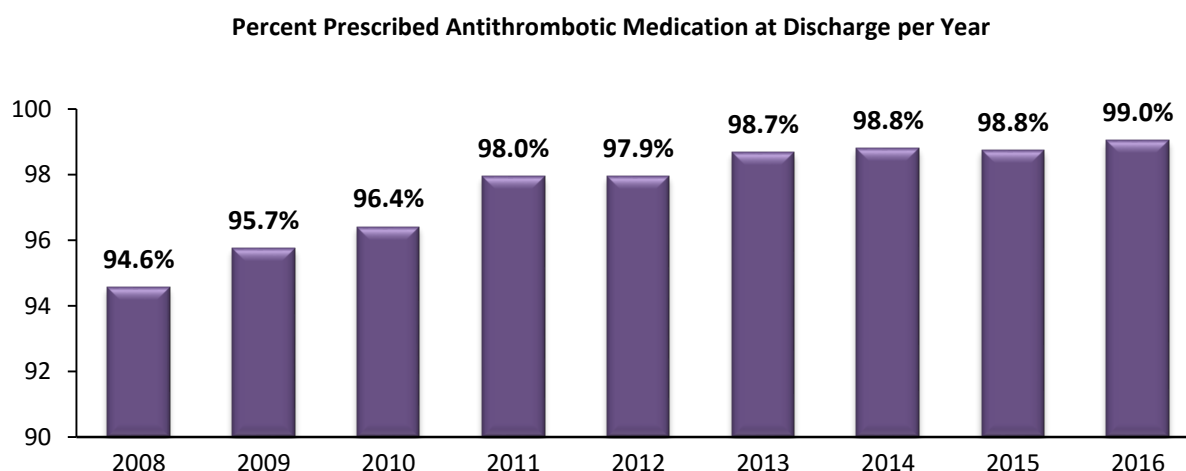


FIGURE 25. ISCHEMIC AND TIA PATIENTS DISCHARGED WITH ANTITHROMBOTIC MEDICATION BY YEAR.

TABLE 20. ISCHEMIC AND TIA PATIENTS DISCHARGED WITH ANTITHROMBOTIC MEDICATION BY YEAR.

Year	Eligible Ischemic stroke & TIA Cases	Antithrombotic prescribed at discharge	Percent Antithrombotic prescribed at discharge	Reporting Hospitals
	N=61,922	n=60,668	%	No.
2008	3,330	3,149	94.6	19
2009	4,282	4,100	95.7	26
2010	5,484	5,287	96.4	32
2011	6,395	6,264	98.0	35
2012	7,307	7,155	97.9	40
2013	8,170	8,062	98.7	43
2014	8,683	8,579	98.8	48
2015	8,384	8,279	98.8	47
2016	9,887	9,793	99.0	47

Between 2008 and 2016, the number of hospitals reporting on this measure increased annually, from 19 in 2008 to 48 participating hospitals in 2014. In 2015 and 2016, the number of hospitals reporting dropped to 47.

ANTI-HYPERTENSIVES PRESCRIBED AT DISCHARGE

From 2008-2016, out of the total 44,634 patients with documented hypertension (SBP \geq 140 mm Hg and/or DBP \geq 90 mm Hg), about 82.5% (n=36,810) were ischemic and TIA patients.

Among the 36,810 ischemic and TIA patients with documented hypertension during the episode of care, less than half, 43.2% (n=15,899) were prescribed anti-hypertensive medication at hospital discharge.

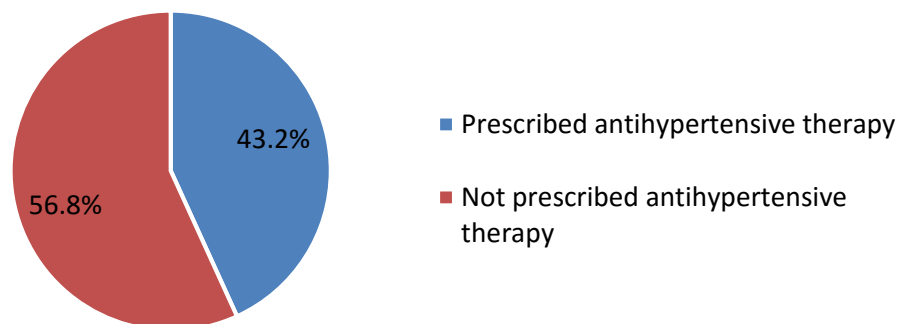


FIGURE 26. PERCENT OF ISCHEMIC AND TIA PATIENTS DISCHARGED WITH ANTIHYPERTENSIVE MEDICATION, 2008-2016.

Types of Anti-hypertensives Prescribed at Discharge per Year

Figure 27 displays the rate of prescription of different anti-hypertensive medications at discharge for ischemic and TIA patients for 2016.

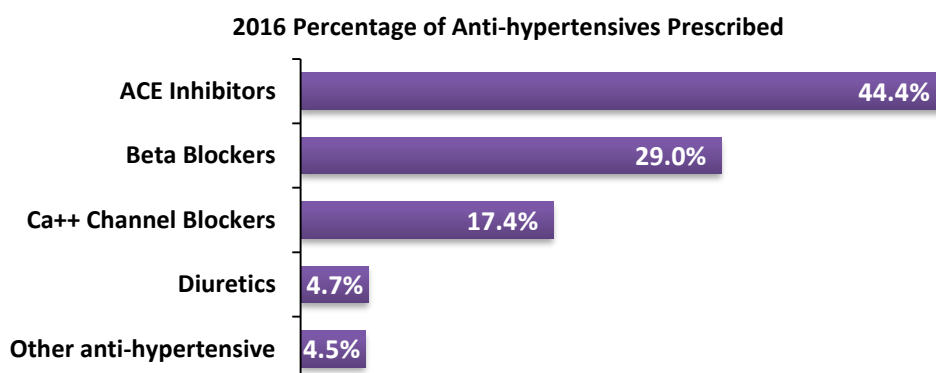


FIGURE 27. ISCHEMIC AND TIA PATIENTS DISCHARGED WITH ANTIHYPERTENSIVE MEDICATION BY YEAR.

Table 21 displays the rate of prescription of different anti-hypertensive medications at discharge for ischemic and TIA patients from 2008-2016.

The percentages among the anti-hypertensive medications prescribed each year (2008-2016) remained similar among the five medication groups. Every year ACE Inhibitors were the most commonly prescribed antihypertensive medication. The second were Beta Blockers, followed by Ca++ Channel Blockers.

TABLE 21. RATE OF ANTIHYPERTENSIVE MEDICATION PRESCRIBED FOR ISCHEMIC AND TIA PATIENTS AT DISCHARGE, BY YEAR.

Year	Patients with anti- hypertensive at discharge											Reporting Hospitals
		ACE		Beta		Ca++ Channel						
		Inhibitors		Blockers		Blockers		Diuretics		Other		
	N=15,899	n=7,658	%	n=4,658	%	n=2,034	%	n=757	%	n=792	%	No.
2008	1,376	657	47.8	412	29.9	111	8.1	104	7.6	92	6.7	16
2009	1,526	701	45.9	473	31.0	175	11.5	91	6.0	86	5.6	24
2010	1,792	874	48.8	541	30.2	206	11.5	71	4.0	100	5.6	31
2011	1,737	903	51.9	488	28.1	184	10.6	66	3.8	96	5.5	35
2012	1,557	795	51.1	416	26.7	189	12.1	69	4.4	88	5.7	39
2013	1,581	803	50.8	461	29.2	182	11.5	76	4.8	59	3.7	42
2014	1,889	926	49.0	520	27.5	272	14.4	87	4.6	84	4.4	48
2015	2,037	931	45.7	649	31.9	296	14.5	81	4.0	80	3.9	47
2016	2,404	1068	44.4	698	29.0	419	17.4	112	4.7	107	4.5	47

Between 2008 and 2016, the number of hospitals reporting on this measure increased from 16 in 2008 to 48 participating hospitals in 2014. In 2015 and 2016, the number of hospitals reporting dropped to 47.

REHABILITATION CONSIDERED

The severity and timely treatment of a stroke can affect health outcomes and recovery, including the stroke survivor's functionality in terms of speech, language, and physical ability.⁵ In order to achieve the best results, physicians should assess all stroke patients for rehabilitative services.⁶

From 2008-2016, among ischemic, hemorrhagic, TIA, and stroke NOS patients, 97.8% (n=60,210) were assessed for rehabilitative services, while 2.2% (n=1,334) of stroke patients were not considered for rehabilitative services (Figure 28).

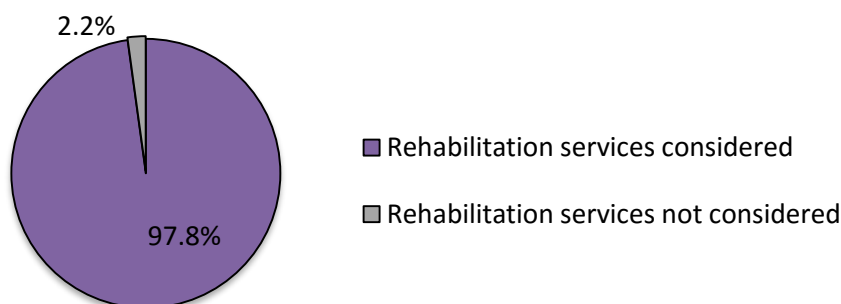


FIGURE 28. PERCENT OF STROKE PATIENTS ASSESSED FOR REHABILITATIVE SERVICES PRIOR TO DISCHARGE, 2008-2016.

Rehabilitation Considered per Year

Figure 29 and Table 22 display the percent of patients diagnosed with ischemic stroke, TIA, ICH, SAH, and stroke NOS that were assessed for rehabilitative services prior to hospital discharge by year.

The percent of eligible patients who were assessed for rehabilitative services ranged from a low of 94.7% in 2009 to a high of 99.1% in 2016.

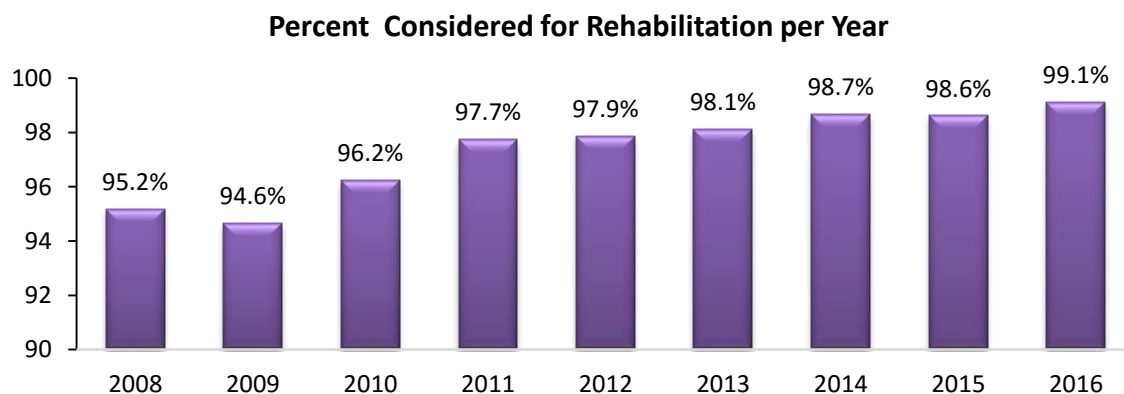


FIGURE 29. STROKE PATIENTS ASSESSED FOR REHABILITATIVE SERVICES PRIOR TO DISCHARGE BY YEAR.

TABLE 22. STROKE PATIENTS ASSESSED FOR REHABILITATIVE SERVICES PRIOR TO DISCHARGE BY YEAR.

Year	Stroke cases	Assessed for rehabilitation	Percent Assessed for rehabilitation	Reporting Hospitals
	N=61,544	n=60,210	%	No.
2008	2,932	2,791	95.2	20
2009	3,998	3,784	94.6	26
2010	5,632	5,420	96.2	32
2011	6,290	6,148	97.7	34
2012	6,921	6,773	97.9	40
2013	7,748	7,602	98.1	43
2014	8,988	8,868	98.7	48
2015	8,682	8,562	98.6	48
2016	10,353	10,262	99.1	48

Between 2008 and 2016, the number of hospitals reporting on this measure increased annually, from 20 in 2008 to 48 participating hospitals in 2014-2016.

STROKE EDUCATION

For stroke survivors and caregivers to be actively involved in the decision making and management of the subsequent long-term effects of their stroke, appropriate information delivered in a timely and effective format is necessary.⁷ Education and/or educational materials must address the following: 1). Activation of emergency medical system, 2). Need for follow-up after discharge, 3). Medications prescribed, 4). Personal risk factors for stroke, and 5). Warning signs for stroke.

From 2008-2016, 89.2% (n=39,253) of stroke patients and/or their caregivers were provided with stroke educational material during their hospital stay that address all five of the required areas mentioned above (Figure 30).

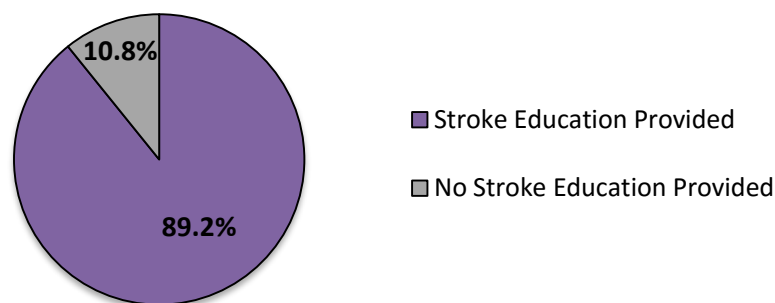


FIGURE 30. PERCENT OF PATIENTS AND CAREGIVERS PROVIDED WITH STROKE EDUCATION/MATERIAL, 2008-2016.

Stroke Education per Year

Figure 31 and Table 23 display the percent of patients and their caregivers who were provided stroke education and/or educational materials during the hospital stay by year.

The percent of eligible stroke patients who received all stroke educational materials increased annually and ranged from a low of 49.9% in 2008 to a high of 97.7% in 2016.

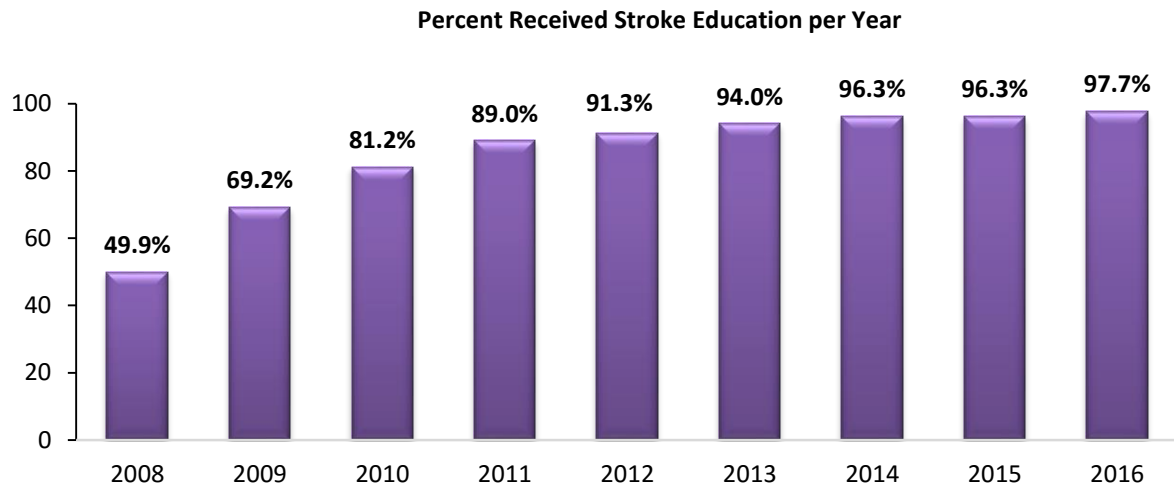


FIGURE 31. PATIENTS AND CAREGIVERS PROVIDED WITH STROKE EDUCATION/MATERIAL DURING HOSPITAL STAY BY YEAR.

TABLE 23. PATIENTS AND CAREGIVERS PROVIDED WITH STROKE EDUCATION/MATERIAL DURING HOSPITAL STAY BY YEAR.

Year	Eligible Stroke Cases N=44,009	Stroke Education n=39,253	Percent Stroke Education %	Reporting Hospitals No.
2008	2,358	1,177	49.9	19
2009	3,010	2,082	69.2	26
2010	3,875	3,145	81.2	32
2011	4,621	4,112	89.0	35
2012	5,165	4,716	91.3	40
2013	5,823	5,474	94.0	43
2014	6,192	5,966	96.4	48
2015	5,877	5,659	96.3	48
2016	7,088	6,922	97.7	48

Between 2008 and 2016, the number of hospitals reporting on this measure increased annually, from 19 in 2008 to 48 participating hospitals in 2014-2016.

MODIFIED RANKIN SCALE AT DISCHARGE

Of the eligible ischemic, hemorrhagic, and stroke NOS patients (n=54,471) from 2011-2016, about one out of four, 27.8% (n=15,149) had a Modified Rankin Scale (mRS) at discharge, 45.3% (n=24,667) did not have a mRS at discharge or the total score was not documented, and 26.9% (n=14,655) of patients were missing mRS data (Figure 32).

- Among the 54,471 cases, the median mRS score was 4-Moderate to severe disability. About 6.4% cases had mRS score 4 (n=3,478).

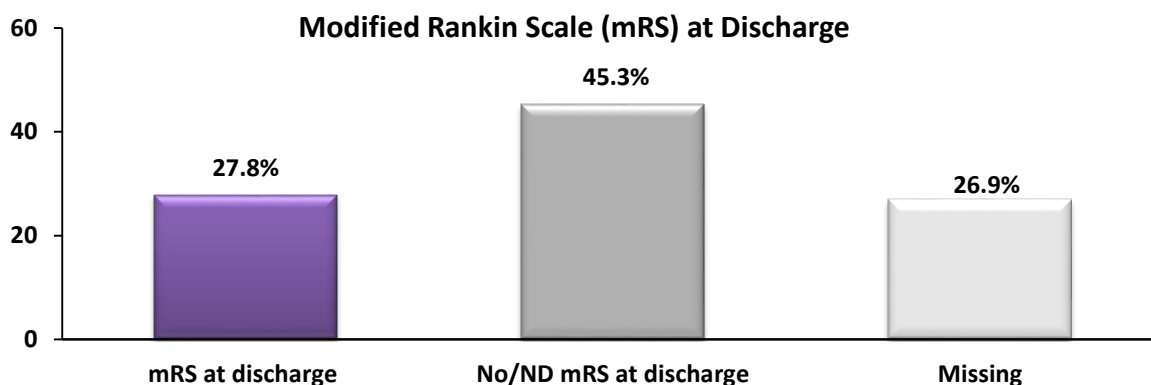


FIGURE 32. PERCENT OF PATIENTS WITH A MODIFIED RANKIN SCALE AT DISCHARGE, 2011-2016.

Modified Rankin Scale (mRS) per Year

Figure 33 and Table 24 display the percent of patients with a mRS at discharge per year.

The percent of ischemic, hemorrhagic, and stroke NOS patients with a mRS at discharge varied annually from a low of 7.3% in 2011 to a high of 40.5% in 2016.

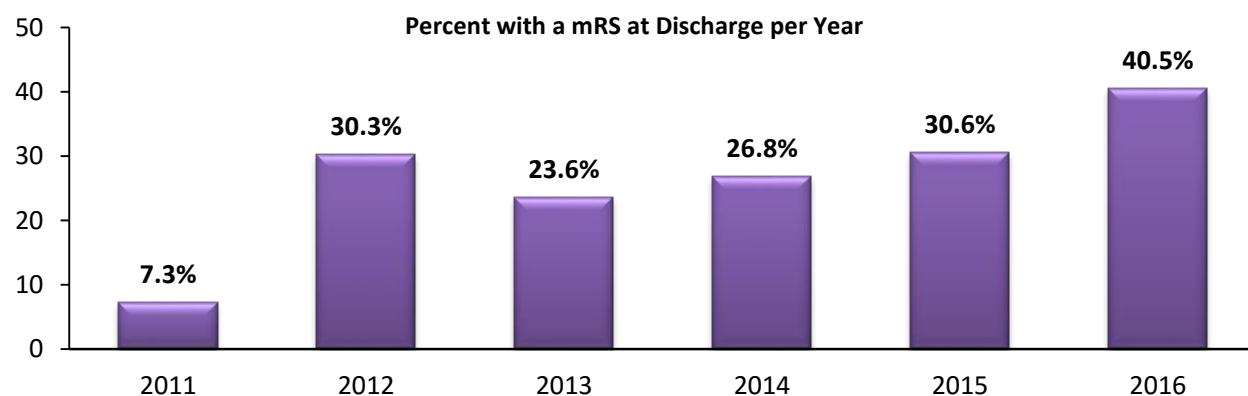


FIGURE 33. PERCENT OF PATIENTS WITH A MODIFIED RANKIN SCALE AT DISCHARGE AND MEDIAN TOTAL SCORE BY YEAR.

Table 24. Percent of patients with a Modified Rankin Scale at discharge and median total score by year.

Year	Eligible Stroke cases	mRS at discharge	Percent with mRS at discharge	Median mRS Total Score	Reporting Hospitals
	N = 54,471	n = 15,149	%	overall median score = 4	No.
2011	7,208	523	7.3	6	35
2012	7,657	2,321	30.3	3	40
2013	8,444	1,995	23.6	3	43
2014	9,918	2,661	26.8	3	48
2015	9,666	2,960	30.6	4	48
2016	11,578	4,689	40.5	3	48

Between 20011 and 2016, the number of hospitals reporting on this measure increased annually, from 35 in 2011 to 48 participating hospitals in 2014-2016.

DISCHARGE DISPOSITION

The discharge disposition, or the plan for care after discharge from the hospital, can provide an indication of the severity and extent of disability of a stroke patient.

Among stroke patients discharged on or after April 1, 2011, more than half, 52.4% were discharged home and nearly one third, 32.6% were discharged to other healthcare facility (Figure 34A).

Of those patients discharged to other healthcare facility, 58.3% were discharged to an inpatient rehabilitation facility (IRF), and 35.0% a skilled nursing facility (SNF) (Figure 34B).

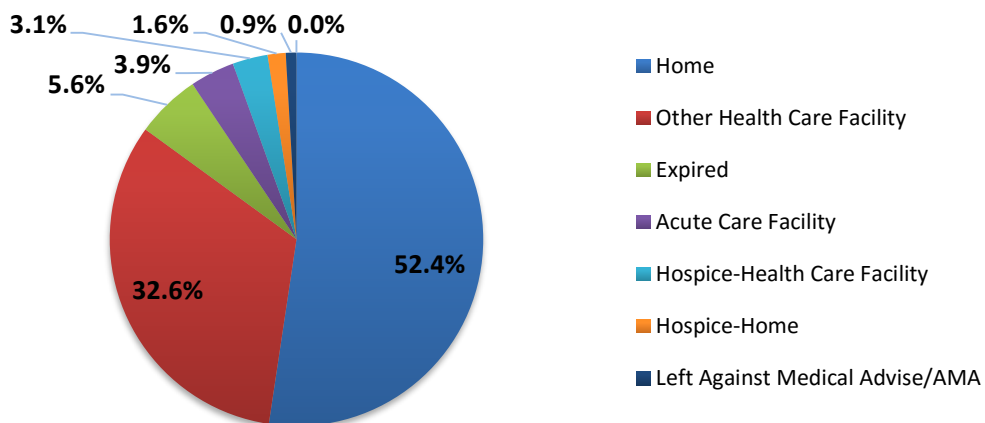


FIGURE 34A. DISCHARGE DISPOSITION OF STROKE PATIENTS, DISCHARGED ON OR AFTER APRIL 1, 2011.

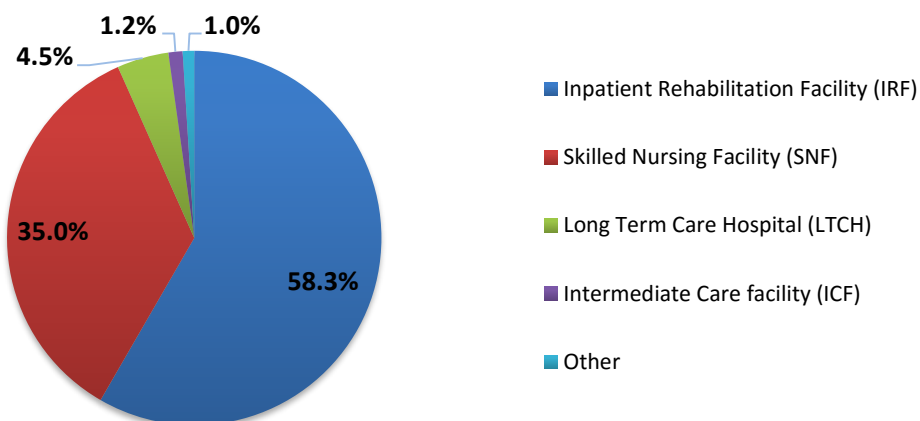


FIGURE 34B. DISCHARGE DISPOSITION AMONG STROKE PATIENTS DISCHARGED TO OTHER HEALTHCARE FACILITY.

Discharge Disposition per Year

Figure 35 and Figure 36 displays the discharge disposition and type of healthcare facility stroke patients are discharged to by year.

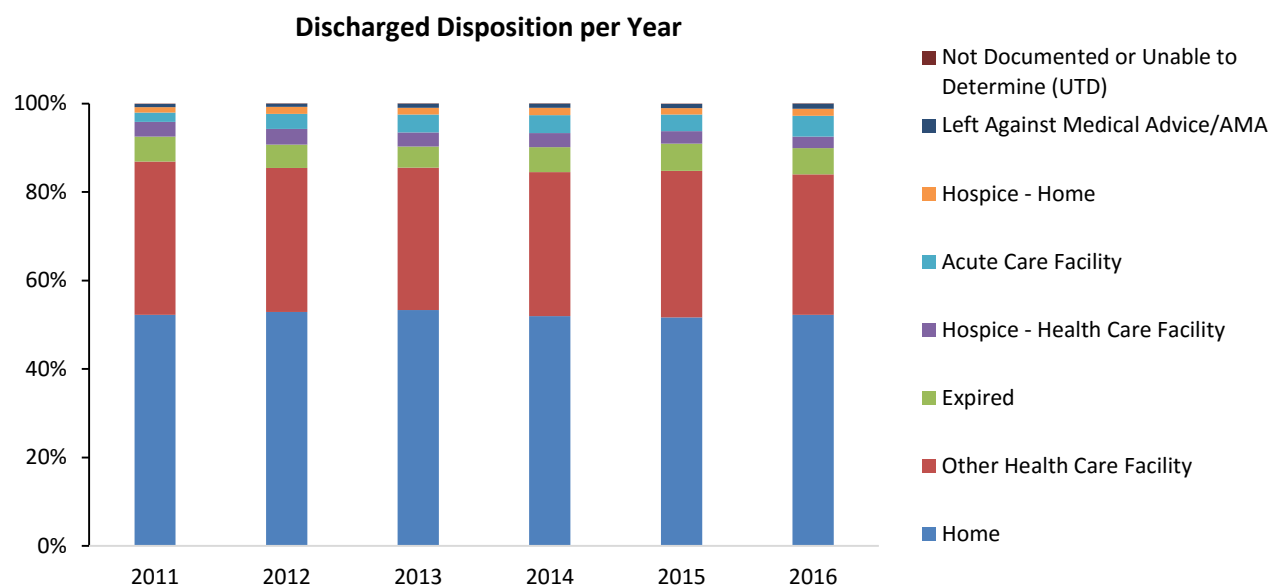


FIGURE 35. DISCHARGE DISPOSITION OF STROKE PATIENTS BY YEAR.

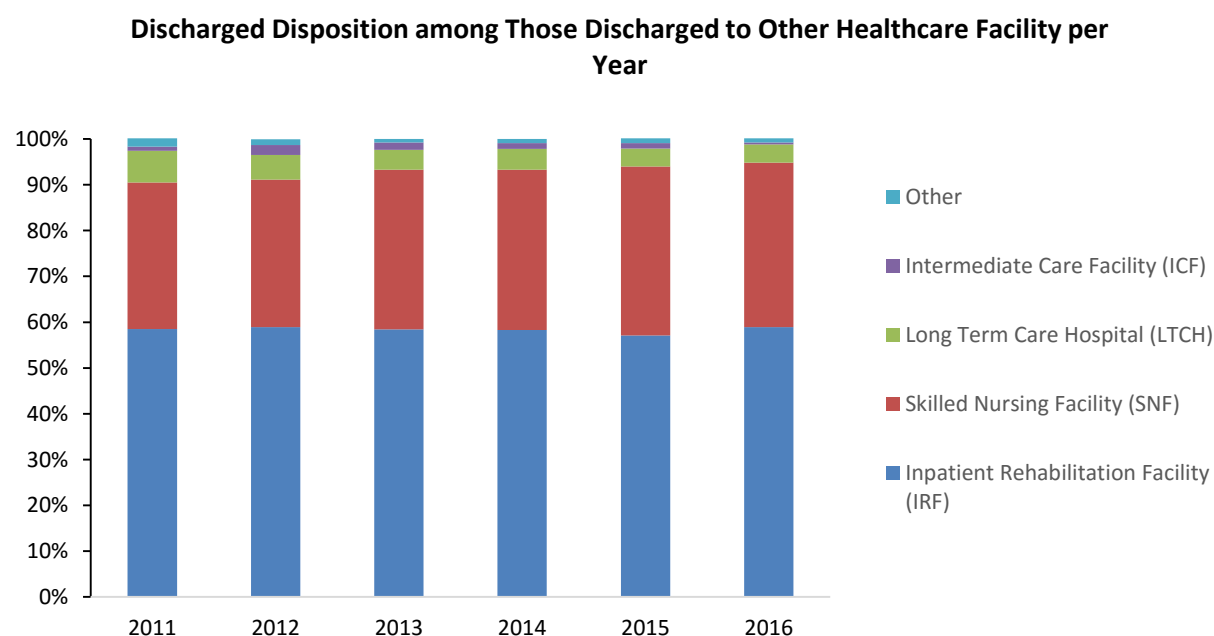


FIGURE 36. DISCHARGE DISPOSITION AMONG STROKE PATIENTS DISCHARGED TO OTHER HEALTHCARE FACILITY BY YEAR.

Between 2011 and 2016, the number of hospitals reporting on this measure increased annually, from 35 to 48 participating hospitals for 2014-2016.

Opportunities may exist in determining if an association exists between patients discharge disposition, home vs. other healthcare facility, and the stroke survivors' utilization of rehabilitative services.

COMORBIDITIES

The following section describes the prevalence of select risk factors and comorbid conditions among 89,917 patients with a diagnosis of Ischemic stroke, Transient Ischemic Attack (TIA), Intracerebral hemorrhage, Subarachnoid hemorrhage, or stroke not otherwise specified (NOS) from 2008-2016. Two different methods are used to estimate the prevalence of the risk factors; 1). Documented medical history either self-reported by the patient or previously documented (medical history is missing for 3.0%, n=2,741 patients), and 2). Documented clinical results measured during the stroke episode of care, if applicable.

The following comorbidities are included in the report.

1. Hypertension
2. Atrial Fibrillation
3. Diabetes Mellitus
4. Documentation of Lipid Profile
5. Lipid Measures – Total Cholesterol, LDL, HDL, and Triglycerides
6. Dyslipidemia
7. Smoking
8. Overweight and Obesity

HYPERTENSION

Treatment of hypertension is thought to be the most important intervention for secondary prevention of ischemic stroke.⁶ Though the relationship between hypertension and stroke recurrence has been less well studied, its importance in preventing recurrent stroke is thought to be of equal importance.⁶

MEDICAL HISTORY

The prevalence of hypertension reported as a previously known medical condition was 75.0% (n=67,451), i.e. three out of four stroke patients (Figure 37).

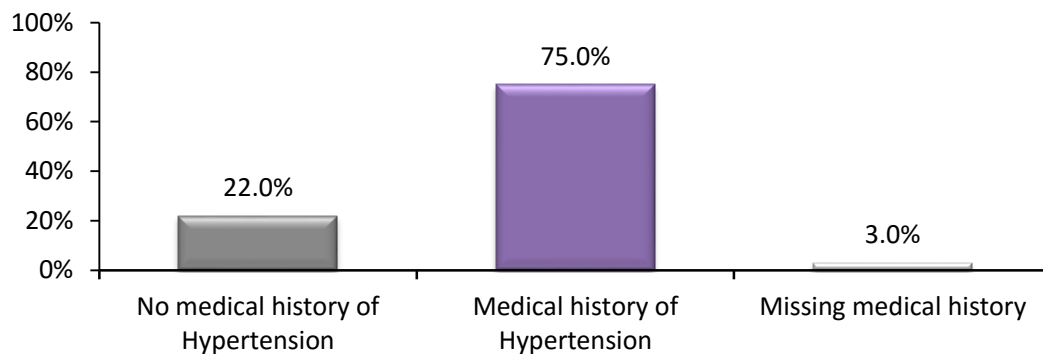


FIGURE 37. MEDICAL HISTORY OF HYPERTENSION, 2008-2016.

EPISODE OF CARE

The prevalence of hypertension documented as SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg during the stroke episode of care, was 49.6% (n=44,634), i.e. one out of two stroke patients (Figure 38).

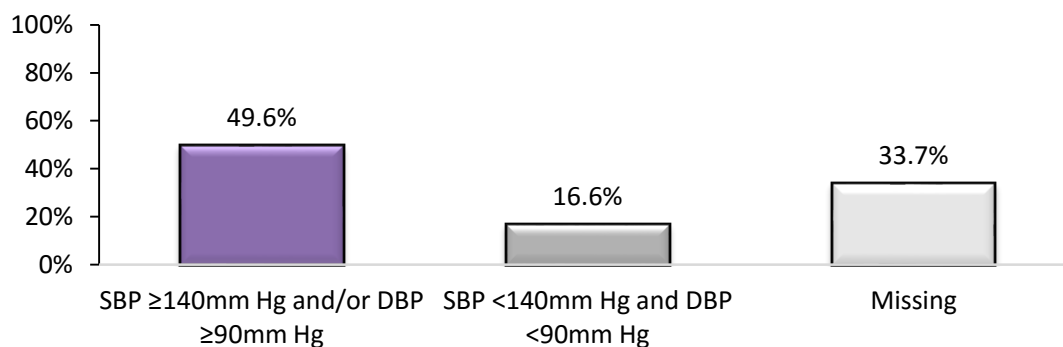


FIGURE 38. PREVALENCE OF HYPERTENSION DURING THE STROKE EPISODE OF CARE, 2008-2016.

The difference between the prevalence of hypertension as a previously known medical condition (75.0%) and the measured SBP/DBP (49.6%) may reflect the management of hypertension during the stroke episode of care.

ATRIAL FIBRILLATION

Atrial fibrillation (AF) is thought to be the cause of approximately 10-12% of all ischemic stroke case in the United States.⁶ AF also increases the risk of stroke reoccurrence in patients with prior and/or recent ischemic stroke or TIA.

The prevalence of AF, reported as a previously known medical condition was 66.4% (n=59,741) (Figure 39).

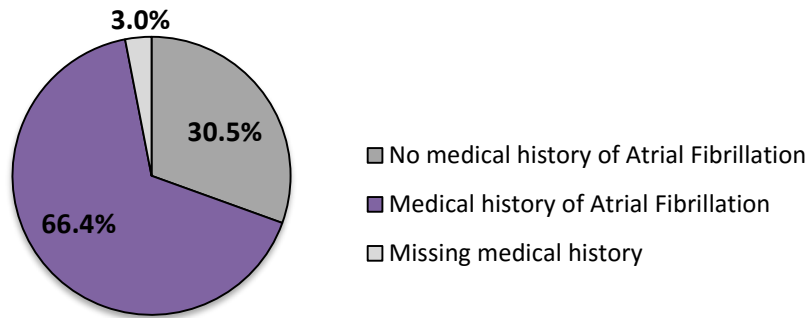


FIGURE 39. MEDICAL HISTORY OF ATRIAL FIBRILLATION, 2008-2016.

DIABETES MELLITUS

Diabetes mellitus is not only associated with an increased risk of initial ischemic stroke but also increases the risk of stroke reoccurrence after the first ischemic stroke is experienced.⁶

The prevalence of diabetes mellitus, reported as a previously known medical condition was 39.6% (n=35,599) (Figure 40).



FIGURE 40. MEDICAL HISTORY OF DIABETES MELLITUS, 2008-2016.

DOCUMENTATION OF LIPID PROFILE

Patients diagnosed with ischemic stroke and TIA should have a lipid profile measurement performed within 24-48 hours of hospital admission, unless documented results of lipid profile performed within the past 30 days exist in patient's medical record.⁶

Among eligible ischemic stroke and TIA patients (n=63,124), 67.7% (n=42,718) had lipid results either documented and performed within 48 hours of hospital admission or were previously documented and performed within 30 days prior to hospital admission (Figure 41).

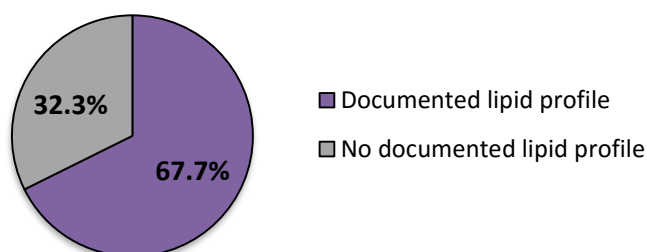


FIGURE 41. ISCHEMIC STROKE AND TIA PATIENTS WITH A DOCUMENTED LIPID PROFILE, 2008-2016.

This indicates a potential gap in the stroke system of care. Opportunity exists in requiring standardized documentation of lipid profiles across all hospital systems in Texas.

LIPID MEASURES – TOTAL CHOLESTEROL, LDL, HDL, TRIGLYCERIDES

Among all stroke patients; 67.1% (n=60,352) had a documented HDL <40 mg/dL, 19.6% (n=17,629) had a documented triglyceride level ≥ 150 mg /dL, 16.1% (n=14,453) had a documented LDL ≥ 130 mg/dL, and 14.0% (n=12,560) had a documented total cholesterol >200 mg/dL (Figure 42). The prevalence of these lipid measure categories are not mutually exclusive, and may not add up to 100%.

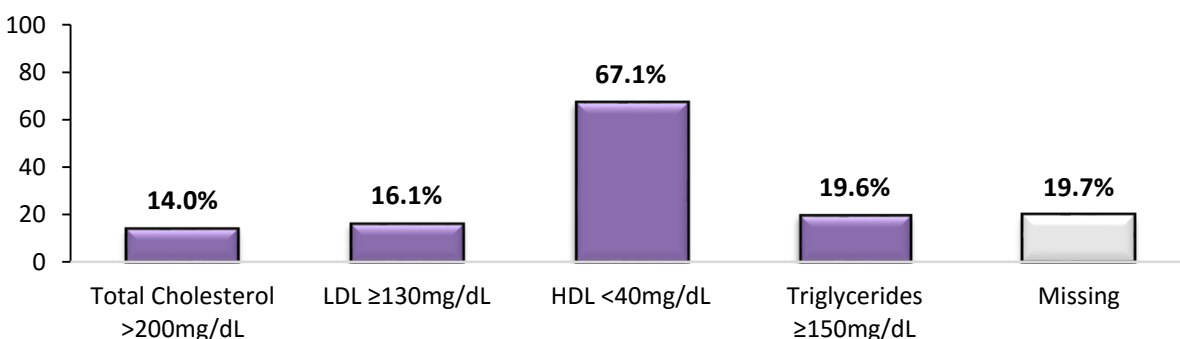


FIGURE 42. PREVALENCE OF HIGH RISK LIPID LEVELS DURING THE STROKE EPISODE OF CARE, 2008-2016.

DYSLIPIDEMIA

Serum lipid biomarkers; elevated triglyceride levels, low HDL, and high LDL, have been associated with an increased risk of stroke and is a primary component for preventing stroke reoccurrence.⁶

The prevalence of dyslipidemia, reported as a previously known medical condition was 39.9% (n=35,876) (Figure 43).

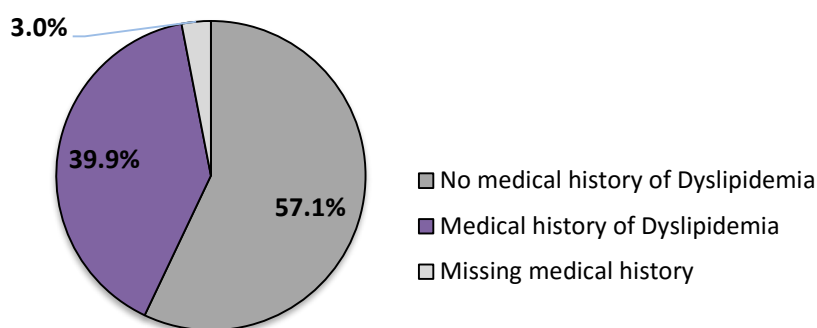


FIGURE 43. MEDICAL HISTORY OF DYSLIPIDEMIA, 2008-2016.

EPISODE OF CARE

Figure 44 displays the prevalence of dyslipidemia by the lipid results; total cholesterol >200 mg/dL, or LDL \geq 130 mg/dL, or HDL <40 mg/dL, performed within 48 hours of hospital admissions or the existing documented results of a lipid profile performed within the past 30 days.

The prevalence of dyslipidemia, reported as lipid levels within 48 hours of admission or within the prior 30 days was 76.5% (n=68,791) (Figure 44).

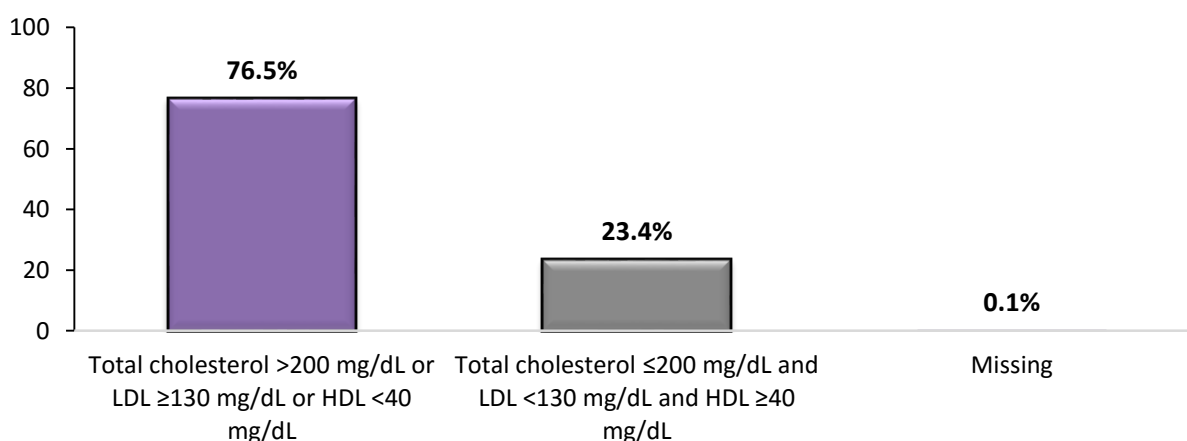


FIGURE 44. PREVALENCE OF DYSLIPIDEMIA DURING THE STROKE EPISODE OF CARE, 2008-2016.

SMOKING

Tobacco use is the largest modifiable risk factor contributing to premature morbidity and mortality in Texas. Smoking cigarettes is an independent risk factor for first ischemic stroke and may nearly double an individual's risk of reoccurrence.⁶

The prevalence of smoking, reported as a previously known medical condition was 24.4% (n=21,897) (Figure 45).

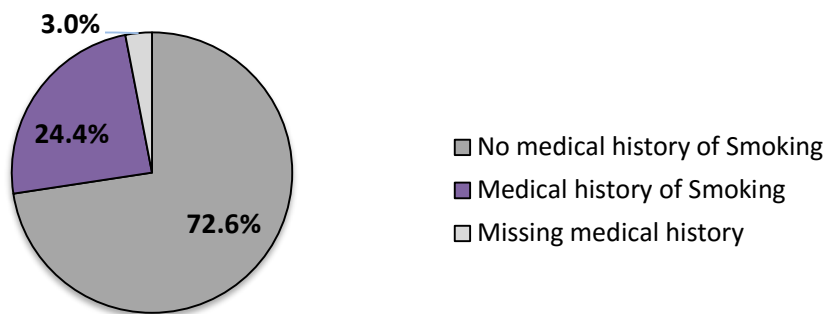


FIGURE 45. MEDICAL HISTORY OF SMOKING, 2008-2016.

SMOKING CESSATION

Healthcare providers should strongly advise every stroke patient who has smoked in the past year to quit to decrease the risk of recurrent stroke.

Among the stroke patients with a history of smoking and admitted to the hospital (n=20,789), 65.5% (n=13,623) received, or caregiver received, smoking cessation counseling prior to hospital discharge (Figure 46).

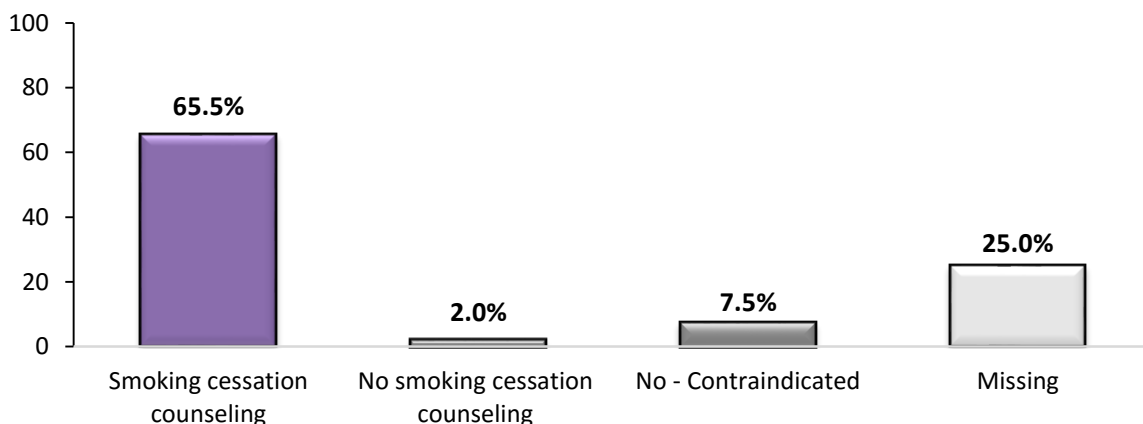


FIGURE 46. STROKE PATIENTS WITH A HISTORY OF SMOKING THAT RECEIVE SMOKING CESSATION PRIOR TO DISCHARGE, 2008-2016.

Research indicates that stroke patients who receive even brief cessation advice from their healthcare provider are more likely to quit smoking than those receiving no counseling at all.³ Opportunity for improvement in smoking cessation counseling exists.

OVERWEIGHT AND OBESITY

Overweight and obesity is associated with an increased risk of stroke, and thought to be linear in nature. For every 1kg/m² increase in Body Mass Index (BMI) of 20kg/m², the risk of stroke is increased by 5%.⁶

The prevalence of overweight/obesity, reported as a previously known medical condition was 12.6% (n=11,318) (Figure 47).



FIGURE 47. MEDICAL HISTORY OF OVERWEIGHT/OBESITY, 2008-2016.

EPISODE OF CARE

The prevalence of overweight and obesity, reported as a BMI ≥ 25 kg/m² calculated from the patients height and weight during the stroke episode of care was 44.3% (n=39,809) (Figure 48).

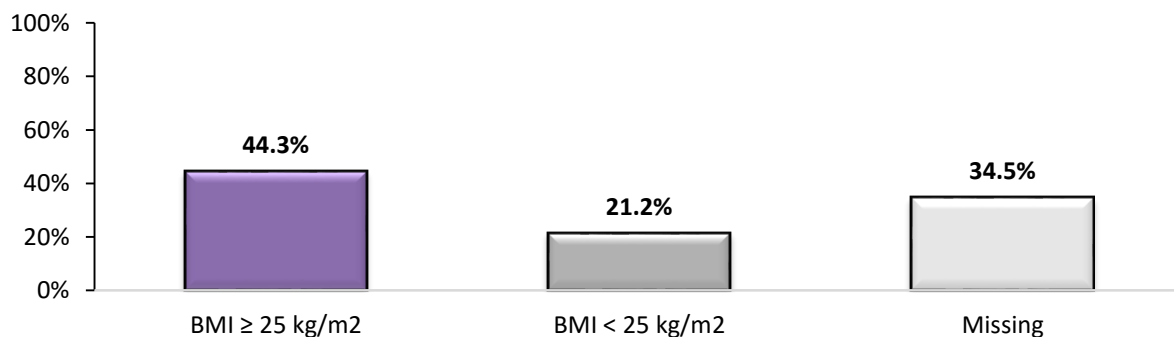


FIGURE 48. PREVALENCE OF BMI ≥ 25 KG/M2 DURING THE STROKE EPISODE OF CARE, 2008-2016.

The significant difference between the medical history (12.6%) and the measured BMI (44.3%) value indicates the under-reporting of overweight/obesity. Although BMI is not reported for 34.5% (n=31,039) of patients, among them 5.6% (n=1,733) self-reported a medical history of overweight/obesity.

APPENDIX

URBAN-RURAL CLASSIFICATION FOR HOSPITAL CHARACTERISTICS AND MEASURES

The Texas Department of State Health Services (DSHS) follows the Metropolitan and Non-Metropolitan county designations defined by the U.S. Office of Budget and Management (OBM). In Texas, 82 counties are designated as Metropolitan and 172 are designated as Non-Metropolitan. The terms “Non-Metropolitan and Metropolitan” and “Urban and Rural” are interchangeable with “Urban and Rural.”
<https://www.dshs.texas.gov/chs/hprc/counties.shtm>

The following are definitions used specifically for this report. The urban and rural categories used are defined based upon the 2013 National Center for Health Statistics (NCHS) Urban-Rural Classification Scheme for Counties. This includes six county-level categories: metropolitan (large central metro, large fringe metro, medium metro, and small metro) and nonmetropolitan (micropolitan and noncore).

URBAN COUNTY

- Large central metro—counties in metropolitan statistical areas (MSA) of 1 million or more population that: contain the entire population of the largest principal city of the MSA, or have their entire population contained in the largest principal city of the MSA, or contain at least 250,000 inhabitants of any principal city of the MSA.
- Large fringe metro—counties in MSAs of 1 million or more population that did not qualify as large central metro counties.
- Medium metro—counties in MSAs of populations of 250,000 to 999,999.
- Small metro—counties in MSAs of populations less than 250,000.

RURAL COUNTY

- Micropolitan—Counties in micropolitan statistical areas.
- Noncore—Nonmetropolitan counties that did not qualify as micropolitan.

TABLE DATA SOURCES

Table 1. Estimated number and unadjusted prevalence of adults, 18 years and older, that report ever having had a stroke in Texas, by race/ethnicity, 2011-2015. (Pg. 6) Data source: Texas Behavioral Risk Factor Surveillance System (2011, 2012, 2013, 2014, 2015).

Table 2. Age-adjusted stroke hospitalization rate (per 10,000), all ages, in Texas, by race/ethnicity, 2010-2014. (Pg. 7) Data source: 2014 Texas Vital Statistics, Population Data; (2) 2014 Texas Vital Statistics, Mortality Data.

Table 3. Stroke hospital discharges and total charges by primary payment source, Texas, 2014. (Pg. 7). Data Source: Texas Health Care Information Collection (THCIC), Inpatient Hospital Discharge Public Use Data File, 2014.

Table 4 – Table 24. EVALUATING HOSPITAL CARE FOR STROKE IN TEXAS (Pgs. 9-53)

Data Source: This Get With The Guidelines® Aggregate Data report was generated using the Quintiles PMT® system. Copy or distribution of the Get With The Guidelines® Aggregate Data is prohibited without the prior written consent of the American Heart Association and Quintiles.

FIGURE DATA SOURCES

Figure 1. The 2011-2015, average age-adjusted number of deaths due to stroke per 100,000 people, all ages, by county, in Texas. (Pg. 8). Data source: County-level mortality data, 2011-2015, and County-level population data, 2011-2015; Texas Department of State Health Services, Center for Health Statistics, Austin, Texas.

Figure 2 – Figure 48. EVALUATING HOSPITAL CARE FOR STROKE IN TEXAS (Pgs. 10-53)

Data Source: This Get With The Guidelines® Aggregate Data report was generated using the Quintiles PMT® system. Copy or distribution of the Get With The Guidelines® Aggregate Data is prohibited without the prior written consent of the American Heart Association and Quintiles.

REFERENCES

1. Mortality data, 2015. Center for Health Statistics, Texas Department of State Health Services.
2. Texas Behavioral Risk Factor Surveillance System Public Use Data File, 2015. Center for Health Statistics, Texas Department of State Health Services.
3. Texas Inpatient Hospital Discharge Public Use Data File, 2014, Center for Health Statistics, Texas Department of State Health Services.
4. American Heart Association. (2012). *Types of stroke*. Retrieved from http://www.strokeassociation.org/STROKEORG/AboutStroke/TypesofStroke/Types-of-Stroke_UCM_308531_SubHomePage.jsp
5. AHA/ASA Guidelines. 2013 Guidelines for the Early Management of Adults with Ischemic Stroke. Available at: <http://stroke.ahajournals.org/content/early/2013/01/31/STR.0b013e318284056a>
6. Kernan, W.N., Ovbiagele, B., Black, H.R., Bravata, D.M., Chimowitz, M.I., Ezekowitz, M.D., Wilson, J.A. (2014). Guidelines for the prevention of stroke in patients with stroke and transient ischemic attack: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*, 2014(45): 2160-2236.
7. AHA/ASA 2016 Guidelines for adult stroke rehabilitation and recovery. Available at: <http://stroke.ahajournals.org/content/47/6/e98>